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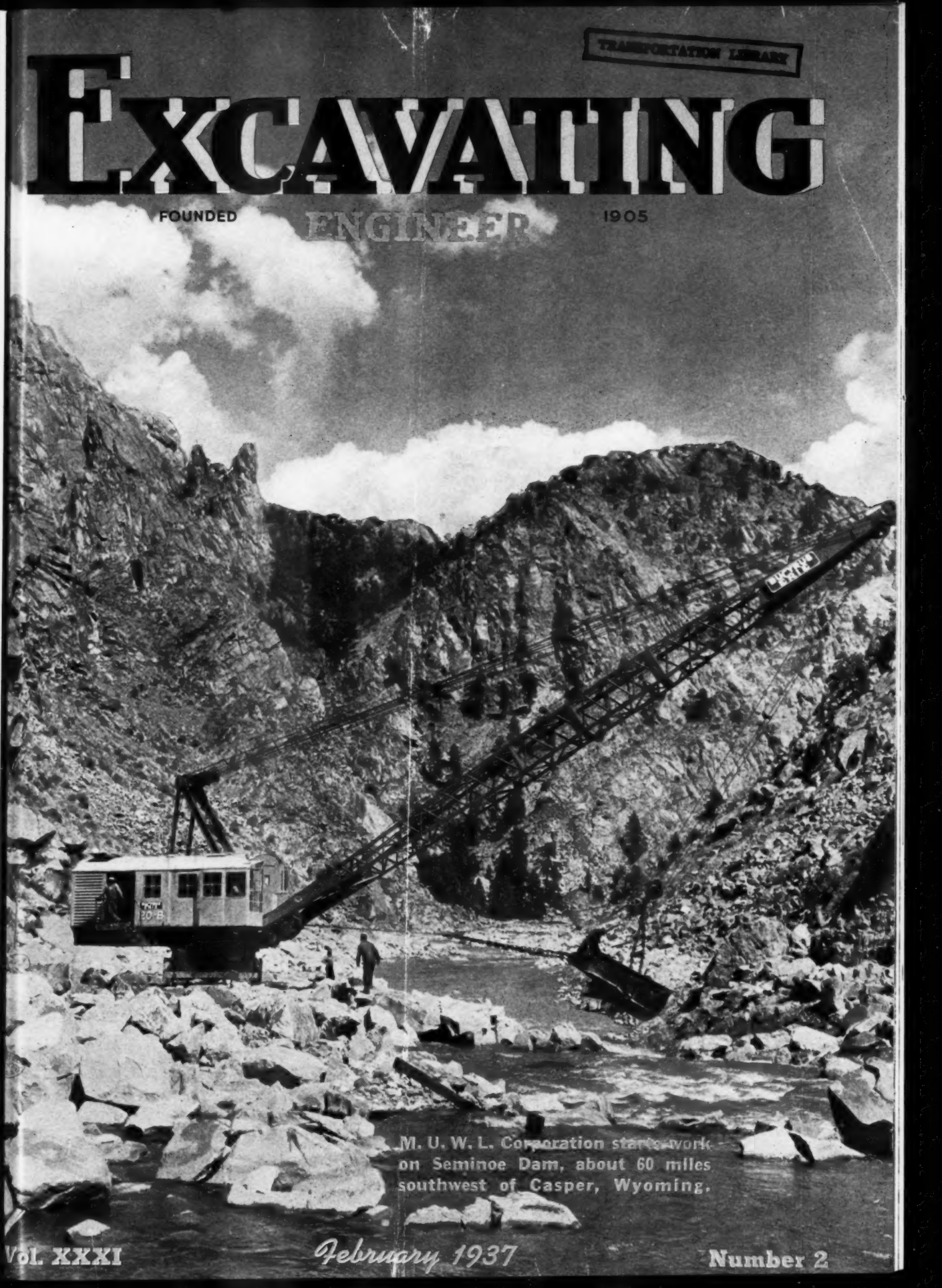

M. U. W. L. Corporation starts work on Seminoe Dam, about 60 miles southwest of Casper, Wyoming.

Vol. XXXI February 1937 Number 2

Every Cartridge a Primer Cartridge . .

WHEN YOU LOAD WITH CORDEAU

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EXCAVATING

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ECA

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CATERP

REG. U. S. PAT. OFF.

Contractors handle over 14,000,000 yards of excavation in constructing the 9,700-foot channel at Fort Peck.

This is the 4th in a series of operating articles describing construction of the world's largest earth-fill dam. Previous articles appeared in the October, November and December issues of **EXCAVATING**.

AS A proving ground for modern men, machines and methods, the spillway matches other phases of the work at Fort Peck. Remarkable speed has been maintained in its construction despite the obstacles offered by weather, isolated location, and the rapid disintegration which characterizes the Bearpaw shale of the site.

Located about three and a quarter miles east of the dam, the spillway is being constructed under general contracts, one of which was completed on September 22, 1936. This was for excavation of a 2,535,945-yard section at the lower end of the spillway which was awarded to Martin Wunderlich of Jefferson City, Missouri.

The second of the contracts, involving over 10,000,000 yards of excavation, concreting a section of the channel about a mile long, and underlying it with a tile drainage system, went to Spillway Builders, Inc., (Massman Construction Company, of Kansas City, Missouri).

The combined firms of Addison Miller, Inc., and Fielding & Shepley were awarded the contract for construction of the gate structure and a concrete cut-off wall at the down-stream end of the lined section. This job involves about 516,000 yards of excavation and the placing of large quantities of concrete and steel.

Design

The completed spillway will have a maximum capacity of 255,000 second-feet. It will be 9,700 feet long, and will range in width from 800 to 130 feet. Maximum depth of cut was 145 feet.

A 1,900-foot approach channel, terminating in a concrete paved section and 30-foot-deep cut-off wall along the upstream edge of the foundations of the gate structure is at the upper end of the spillway. Next come the gates themselves—25- by 40-foot Stoney type, and 16 in number. These will be suspended between steel-reinforced concrete piers 49 feet high; with a maximum thickness of 12 feet. This structure is supported on a 75-foot wide, 12-foot thick concrete slab which, in turn, rests on 467 concrete piles, 5 feet in diameter, extending 30 to 43 feet down into the firm shale. The foundation thus constructed would be strong enough to support the gate structure should undermining occur despite the 30-foot cut-off wall and drainage system. As with the whole Fort Peck project, no chances are taken—the margin of safety being large.

The concrete piers for the gate structure are set in a curve, and 15 of them are continued, tapering, downstream for 187 feet to serve as training walls. These walls are set on heavy concrete

● This view of Spillway Builders' operations shows method of laying concrete in alternate slabs. In background, the method of cutting shale with electric saws is evident.

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slab foundations into which they are tied by reinforcing steel rods.

Below the gates, the channel narrows to 130 feet (at the gates being about 800 feet) and is lined with concrete for about a mile. Although the approach section is level, the spillway below the gates will have a 5.23 per cent down grade, which will give the flowing water a maximum speed of 65 miles an hour.

To prevent back scour from this rushing torrent, a concrete cut-off wall is being constructed at the downstream end of the lined section. This cut-off will be of cellular construction with walls 8 feet thick. Crosswalls of the same thickness will brace the cells. Excavation will extend a maximum of 130 feet below the top of the ground at present, which is the level of the side berms. Flanking the center section, the cut-off wall will have two wing walls of the same type of construction.

A tile drainage system, consisting of a main 24-inch pipe running along the centerline of the channel, transverse feeder lines every 80 feet, and 6-inch feeder lines under every transverse construction joint, will collect seepage water under the concreted section.

Below the cut-off wall, an unlined, excavated channel in the form of an elongated stilling basin, leads out to the Missouri.

Excavation

The first contract to be awarded was that of Martin Wunderlich. First work on the spillway, however, was undertaken by the Army Engineers. Using rented power shovels and elevating graders, they began working on a road to the spillway and, pending moving in of the contractors equipment, cutting down the highest spots in the area to be excava[illegible]50,229 yards was handled[illegible]the Army Engineers before they turned over the job to the contractor.

The Wunderlich contract was awarded late in October, 1934, and work was actually begun on November 17. The job was wound up on September 22, 1935, three months ahead of schedule.

For the work, the contractor moved in four 1½-yard Lorain 75 Diesel shovels, 11 Euclid rear dump wagons, 10 Euclid bottom dump wagons, 1 Le Tourneau 12-yard scraper, 1 Ateco 4-yard scraper, and a fleet of Caterpillar tractors for hauling the wagons. Caterpillar and Allis-Chalmers tractors equipped with Baker, Le-Tourneau and Euclid bulldozers were used for maintaining haul roads and for trimming slopes. Additional rented equipment was used to some extent.

The shale formation is harder at the lower end of the channel than at the upper end, and required considerable blasting. A crew of drillers, working well ahead of the shovels and carefuly spotted not to interfere with hauling roads, put down vertical holes by hand to nine or ten feet depth. Average daily boring ran about 244 holes, handled on two shifts. About 4¾ pounds of 30 percent special gelatin were loaded in each hole. Detachable drill bits running from two to eighteen feet in length, were sharpened by hand after about twelve hours' use. A toolsmith operated an electric grinder on the day shifts.

The job was very carefully laid out to secure maximum shovel efficiency. Hills were first leveled to permit laying out of straight shovel cuts, up to 1,000 feet in length, running parallel to the center line of the channel. Average single cut was about 11 feet deep and 23 feet wide. Channel sides were sloped one to two in shale, and one to three in overburden. Very large chunks were broken and loaded by the shovels. The working area was sprinkled to keep down dust, a 1000-gallon International tank truck being used, two shifts daily for the purpose.

Operations were on a three six-hour and forty-minute shift daily basis, with the "off" period between shifts used for servicing

Top two photos show opposite ends of the Martin Wunderlich section. Note compressors and drillers in background. In dry weather, shale-surfaced hauling roads tended to grow extremely dusty. Consequently, sprinkler trucks like the one shown here were constantly employed. Bottom picture shows method used to trim slopes to final grade on the Wunderlich contract.

and repair of major equipment. Hauling roads were continuously maintained by bulldozers, and channel side slopes were trimmed with tractor-drawn scrapers.

The contractor handled his own repair work, maintaining a shop equipped with electric and acetylene welders, and a blacksmith shop. The regular working force at the shop was ten men.

Altogether, Martin Wunderlich moved 2,535,945 yards of shale on hauls averaging ⅞ of a mile long. Average daily output was about 10,000 yards.

W. J. Foster was general superintendent; Ted Wunderlich, night superintendent; W. M. Cannum, shop superintendent; and Leonard Handy, shovel mechanic.

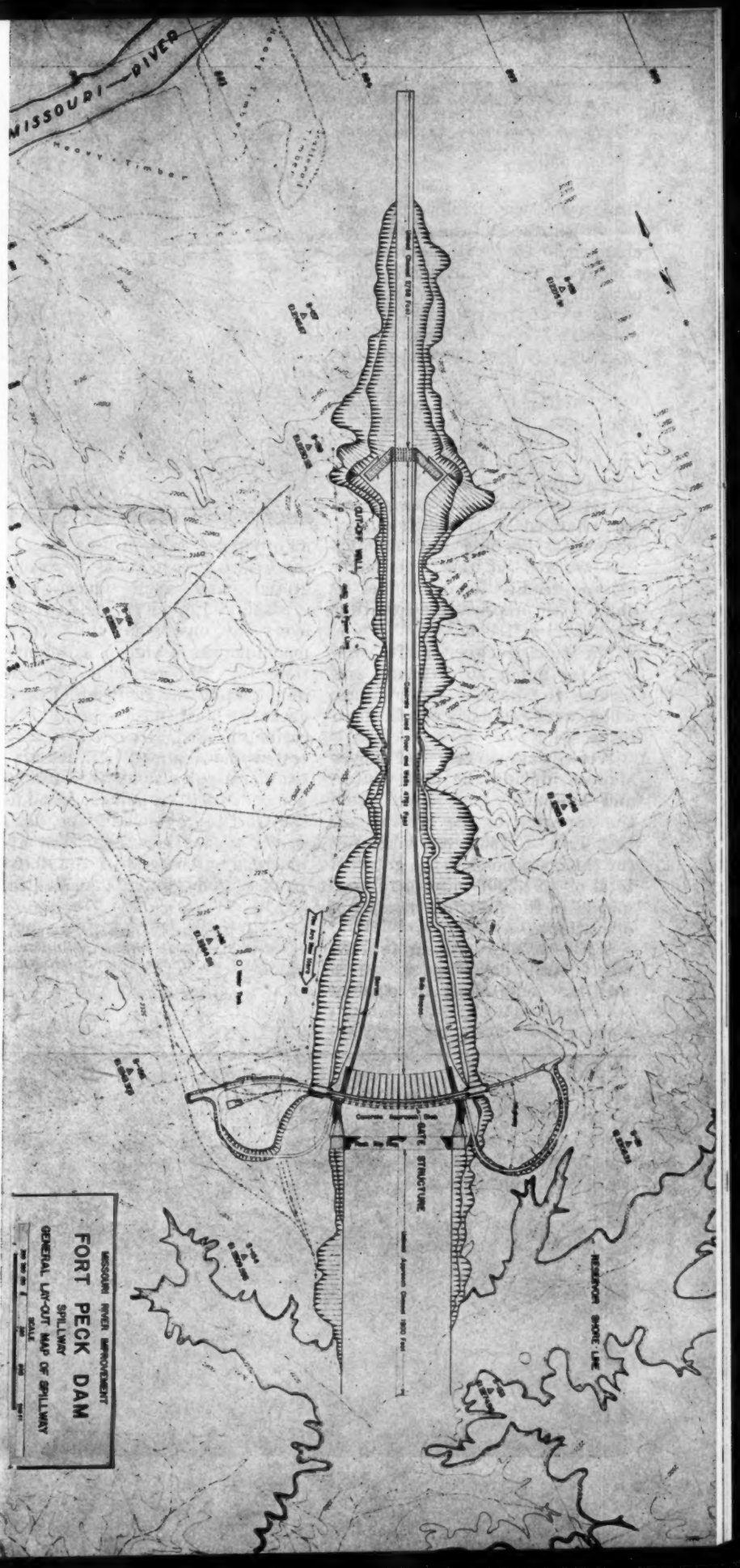
Spillway Builders, Inc.

The second spillway contract to be let called for excavation of the approach channel and central sections, and concreting of the latter. The Massman Construction Company of Kansas City (operating locally under the name of Spillway Builders, Inc.) began work on the approach section at high speed in order to permit beginning work on the gate structure as early as possible.

To handle the excavation of over 10,000,000 yards, nine new 2-yard shovels were purchased—5 Bucyrus-Erie 43-Bs and 4 Lima 701s. A fleet of 45 new 5-ton White trucks and 25 Diamond T's were purchased. Other trucks, rented, brought the total hauling units to 175. In order to speed up the start of operations, 5 1¼-yard shovels were rented. Two of their own draglines were used on the first section trimming slopes. Ten Caterpillar tractors equipped with LaPlante-Choate bulldozers, and two Caterpillar auto-patrols maintained dumping areas and roads.

As with Wunderlich job, the first operation was to level the hills to permit laying out straight, 1,500-foot shovel cuts. Bench cuts, 10 to 12 feet deep, and working in toward the center of the channel were made. Little blasting was required in this section, the only shooting being done to break up frozen patches.

At the beginning, December



● *Part of Spillway Builders' fleet of fast trucks on the way to spoil area. Maintaining hauling roads was a tough problem in wet weather.*

1934, work was handled in four 5-hour shifts, but this was later changed to three 6½-hour shifts six days a week. Shovel cuts were carefully planned, with hauling roads worked out in advance on maps. The system devised worked so effectively that an average output of 35,000 yards a day was maintained. Average haul was 1½ miles.

Each shovel had from 9 to 14 trucks assigned to it each shift. These stayed with the same shovel throughout the period unless changed by the shift superintendent. Loading and hauling was worked so that the shale moved steadily from channel to dump with practically no waiting for shovel or trucks.

The time between shifts was used for minor adjustments and service to shovels and tractors, which were regularly checked and inspected.

Work was slowed, but never stopped, during the first winter, and equipment was moved from the approach to the central section June 8, 1935, to make way for the operations at the gates. A total of 4,543,000 yards had been moved in the first five months of operations.

With trucks averaging 120 miles each day, under varied weather conditions, an efficient maintenance system was necessary. Two grease racks were operated, and each truck was greased and given a change of oil every day, on the day shift. Each machine was assigned a definite time for this servicing. In ten minutes, oil was changed, chassis greased, hoist mechanism lubrication checked, tires and battery tested and changed if necessary. Crank case oil was distilled and 90 per cent of it reclaimed. In addition to this regular service, each driver turned in a report on his machine at the end of the shift. Brakes and general mechanical condition received frequent inspection.

Refueling of trucks was handled with maximum efficiency and speed. Trucks were painted either red or white. When a white flag was displayed on the road to the dump, all white trucks pulled in at five filling stations on their return trip. Less than one minute was required to fill a gas tank. If all stations were full, trucks took another load and made the refueling on the next return trip.

A completely-equipped repair shop was maintained on the job, capable of all major repairs—even to complete rebuilding of a truck. If shovels needed more repairs than could be given them in the between-shift period, they were brought into the shop. Like

● *Very little blasting was necessary on the Spillway Builders' section. Here, one of their Bucyrus-Erie 1½-yard Diesel shovels is cutting down a hill.*

● *This aerial view shows approach section, gate structures and concrete-lined section of spillway. Concrete plants of Addison Miller and Fielding & Shepley and Spillway Builders can be seen at left.*

other parts of the giant Fort Peck project, the spillway could not wait for new parts or repairs from distant sources. The work had to — and did — go on with speed.

In excavating the mile-long section below the gates, Spillway Builders used the same general plan of section as used by Wunderlich. Because of the rapid disintegration of the Bearpaw shale when exposed to air, however, a "blanket" layer eight feet thick was left above finished level until just before concreting. When this layer was stripped off, the exposed surface was sprayed with the same bituminous coating used to retard disintegration in the diversion tunnels. The amount of blanketing which had to be removed just prior to concreting was about 1,000,000 yards, some of which still remains to be moved next spring.

A major problem, both with Spillway Builders and Martin Wunderlich, was keeping hauling equipment going when thaws and rains made the roads slippery. Crushed shale was spread on the surface by bulldozers at such times. Fortunately, not enough wet weather was encountered to hamper operations severely.

Spillway Builders finished up the major part of their excavating in November, 1935, and concreting was begun in April, 1936. This lining is being placed in three sections; floor slab, side wall, and curved coping. The section to be lined varied in width from 800 feet at the gates to 130 feet three-fourths of the way down the lining.

Following stripping of the blanket in this section, about 26 miles of drain pipe was installed under floor and side walls. Cutting trenches for this pipe was a real problem—solved by the use of ingenious shale saws. These tools were used to cut V-notches in the shale, and the core was removed by a drag shovel (or trench hoe). Pipe was laid, and covered by a layer of gravel, topped by a concrete key connecting with the bottom of the floor slabs.

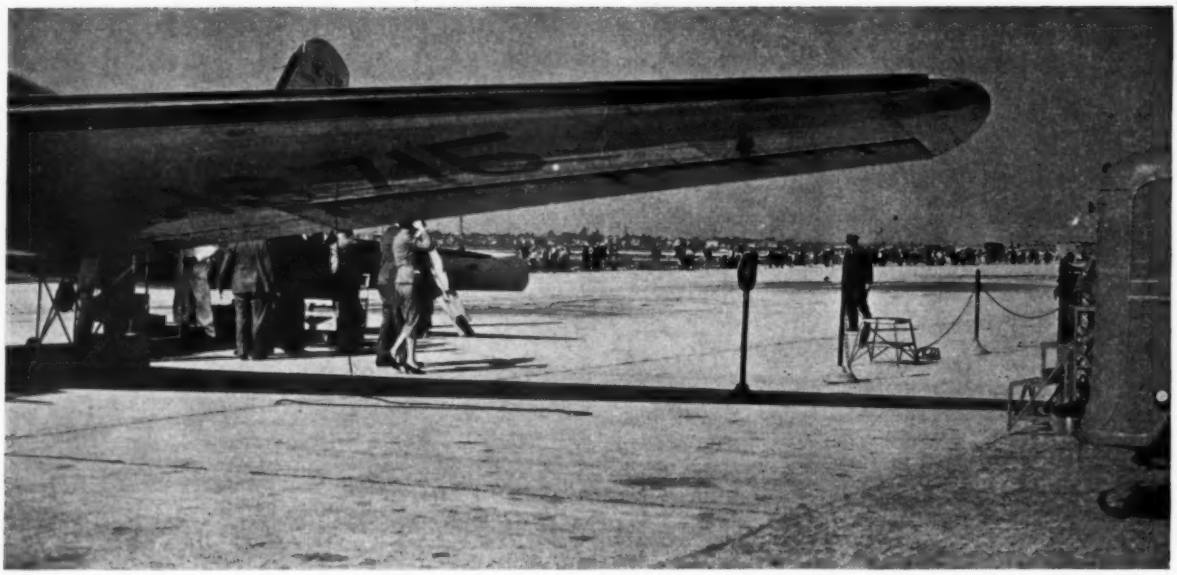
These were poured in 20- by 40-foot sections, minimum 28 inches thick and heavily reinforced with steel, and doweled into adjoining sections. All joints were protected with butt-welded steel sealing strips. Concrete was mixed in three 2-yard Ransome mixers, at a Blaw-Knox central plant, using aggregate and cement furnished by the Government. Aggregate was stock-piled at the site during the summer of 1935. Actual pouring was handled with 2-yard dump buckets hauled by flat-bed trucks. Crawler cranes hoisted the buckets to the forms. Pouring was continuous, 24 hours a day, six days a week, and an average of 10 floor slabs were placed per day during the 1936 season. Steel reinforcing was made up in units in the storage yard and hauled to the forms on flat-bed trucks or long trailers.

Side wall paving was placed with traveling, cantilever-type steel forms, and was topped by an 8-foot-high coping section. When winter forced a shutdown in pouring, 157,729 yards had been placed in flooring, 18,040 yards in side walls, and 8,520 yards in coping.

Spillway Builders have maintained an interesting and successful safety program in their work. B. C. Skeen was in charge of personnel and safety. Once a month the entire organization, including subcontractors' employees, attended a safety meeting where accidents are analyzed and the causes determined. As members of the National Safety Council, the company receives safety posters for use on the job, in offices, garages and in dashboard holders on trucks. A first aid station and safety engineer were on duty 24 hours a day, and every effort has been made to keep all employees constantly safety-conscious. Truck routings are planned with safety in mind, and speed limits are set when driving conditions are bad.

A. D. Harvey is general manager for Spillway Builders, H. E.

(Continued on page 124)



W.P.A. Airport Cost Summary

By **PERRY A. FELLOWS**
Assistant Chief Engineer,
Works Progress Administration

EXCAVATION has been an important part of the work of the Works Progress Administration. In the construction of airports, sewers, roads and streets, dikes, levees and embankments, building trenches, ditches, dams, parks and playgrounds, the WPA has moved an enormous amount of earth, some by hand shovel but by far the greater part by machinery.

Costs on that part moved by hand necessarily are much greater than that moved by machinery and it has been the experience of the WPA engineers that the cost of earth excavation by machinery varies greatly with the terrain, and of course, with the type of excavation. Some interesting figures on costs of excavation by machinery have been assembled with relation to earth moving projects for airports in various parts of the country. Some examples will be given for projects now under way or completed.

In constructing the airport at Troy, N. Y., the machinery used consisted of trucks and teams provided by the Works Progress Administration, and graders, power shovels, bull-dozers and roller supplied by the sponsors. It was estimated that at the time of the report that $11,000 had been spent for the rental of the shovel and $3,435 for the rental of the bull-dozers. The estimated rental cost of the 12-yard carryall was $12.00 per hour. About 200 hours work was contemplated. The total rental cost of the roller was estimated at $640.00 on the basis of $20.00 per day. The total estimated cost of truck and team hire was approximately $27,000 of which more than half had been spent at the time of the report.

The project included quite a range of activity and the work which had already been accomplished included 9,275 cubic yards of topsoil loaded and spread. A part of this was done by hand and the cost per cubic yard ranged according to the conditions from 17 cents to $2.00 per cubic yard. The carting of 39,875 cubic yards of topsoil was at the rate of 41 cents per cubic yard. Fifteen thousand cubic yards of rock was loaded at 17 cents per cubic yard. Eighty-six acres of clearing and grubbing was done at the rate of $200 per acre, and 265,500 square yards of fine grading at a cost of 10 cents per square yard.

A report of September 26, 1936, on the construction of the Schenectady, N. Y., County Airport, showed that in addition to the usual trucks, a power shovel was employed as well as a bull-dozer; two power graders, one of which was 10 ton capacity; two power rollers, 5 ton and 10 ton; and a scraper. The material was mostly a sandy loam which had to be moved an average distance of a quarter of a mile. The shovel had been employed 288 hours, the trucks 1,128 hours, and the power grader, 131½ hours. The fill on the northwest runway carried an estimated cut of 2,990 cubic yards and the unit cost was 48.2 cents per cubic yard. Landscaping was being done at 8.5 cents per square yard, and the concrete apron was being laid at a cost of $11.52 per cubic yard.

At the Jamestown, Chautauqua County, N. Y. airport, the trucks were employed to the extent of 608½ hours, skimmer 63½ hours, shovel 70 hours, 1-man grader 63 hours, tractor 75 hours, 12 cubic yard scraper 9 days at an average of 10 hours per day, tractor 93½ hours, air compressor 12 hours. A large excavation estimated at 140,000 cubic yards was being carried forward at the unit cost of 38.8 cents. The total cost for the work was $943,593. Some rock was encountered but the material was generally loose and

● *Power shovels and other dirt moving machinery have handled the biggest part of material moved by W. P. A. These shovels are working on the airport at Scranton, Pennsylvania.*

sandy. The haul averaged approximately 1,000 feet.

At the Syracuse, N. Y., airport, a similar report indicates that 10,000 cubic yards of excavation and fill was being accomplished at the unit cost of 94 cents and that the fine grading was being done at a cost of 25 cents per square yard. This included a wide variety of material. Power shovels, graders, loaders, bull-dozers, trucks, and rollers were being used to help in this work. Much of the grading involved a haul approximately one mile long.

Excavation for the Rochester, N. Y., airport, totalling 362,595 cubic yards showed a unit cost of 49 cents and 324,760 cubic yards of embankment showed a unit cost of 9.75 cents. Trench excavation was to the extent of 18,300 cubic yards, being carried forward at a cost of $2.18 per cubic yard, while 10½ cents per square yard was the unit cost for the fine grading. Power shovels, tractors, trucks, and rollers were being used on this work. Tractor and spreader boxes were also employed in addition to the usual teams, trucks, and other normal equipment. The material was generally sandy, with some boulders.

At the Tri-City Airport (McKellar Field) in Sullivan County, Tenn., the labor for the operations has been drawn from Kingsport, Bristol, and Johnson City. The exceptionally dry summer has caused the job to be very dusty, making the working conditions disagreeable at times. The work is well organized and full advantage has been taken of modern earth-moving machinery. The work that has been completed to date is as follows: All of the clearing, involving about 30 acres, has been completed at a cost of $151.65 per acre. The total excavation is estimated at 1,460,000 cubic yards, of which 1,200,000 has been removed. The cost of this work averages 19.6 cents per cubic yard. The grading operations are being carried on with two 1¼ cubic yard full revolving gas shovels with tractor type tread, wagons and tractors; 4 large cable controlled and tractor drawn power scrapers; together with tractor drawn graders and crawler type bull-dozers. Considerable rock is being encountered and this is being loosened with dynamite. The stone is being used for rip-rapping embankments around the field.

At the Knoxville, Tenn., airport there are employed approximately 403 men and their work is being fully supplemented and made effective by the extensive use of the latest mechanical earth-moving equipment. Grading operations are being carried on with five 12 cubic yard power scrapers, both of the cable controlled and hydraulic type; one elevating grader, with pneumatic tire dump trucks; caterpillar rooters, bull-dozers and tractor drawn graders. The haul averages a little under 2,000 feet. No rock has been encountered and the grading is practically completed. Of a total of 1,100,000 cubic yards of excavation, the average cost is 15.4 cents per cubic yard. Forty-six acres of clearing was completed at a cost of $153.00 per acre.

A Works Progress Administra-

● *This W. P. A. job near Harrisburg, Pennsylvania, cost $714,000, involved complete drainage of the field, removal of 300,000 yards of dirt, and placing of 50,000 tons of crushed stone.*

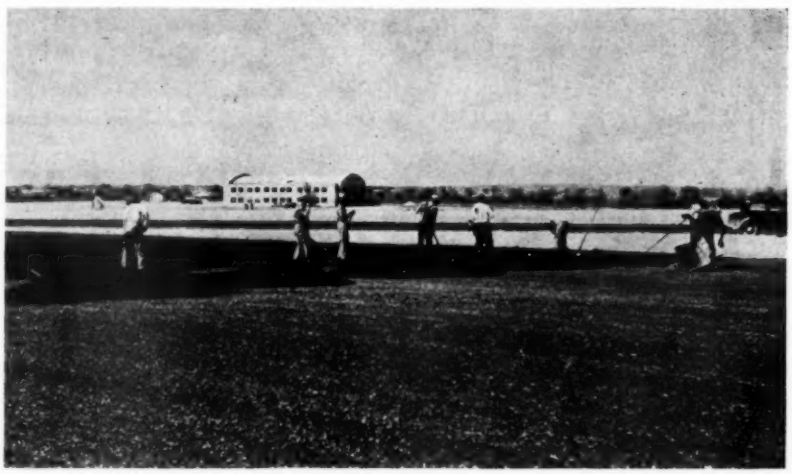
● *An air view of the airport at Syracuse, New York. W. P. A. work on airports all over the country has included grading, filling, laying runways, and constructing buildings.*

tion project for the enlargement and improvement of an existing field at the Chattanooga, Tenn., Municipal Airport employed 268 relief men. Only 354,000 cubic yards of excavation is involved in this project, of which a small portion was hand excavation and 76,000 cubic yards shovel cut at 33 cents per cubic yard; 103,000 cubic yards rock shovel excavation at 44 cents per cubic yard; 40,000 cubic yards common excavation with 5 yard scraper at 15 cents per cubic yard; 4,000 cubic yards of rock by hand excavation at $1.49 per cubic yard; 30,000 cubic yards earth excavation with 12 cubic yard Carryall scraper at 12 cents per cubic yard; and 5,000 cubic yards of hand trenching excavation at $1.43. The haul averages approximately 1,500 feet. Grading operations are being carried on with a 1½ cubic yard revolving gas shovel, with pneumatic tire trucks; one 12 yard scraper and various bull-dozers and grade units. Much rock was encountered, making a portable pneumatic drilling outfit necessary. The unit cost was $114.81 per acre for which 88 acres of clearing and grubbing was accomplished.

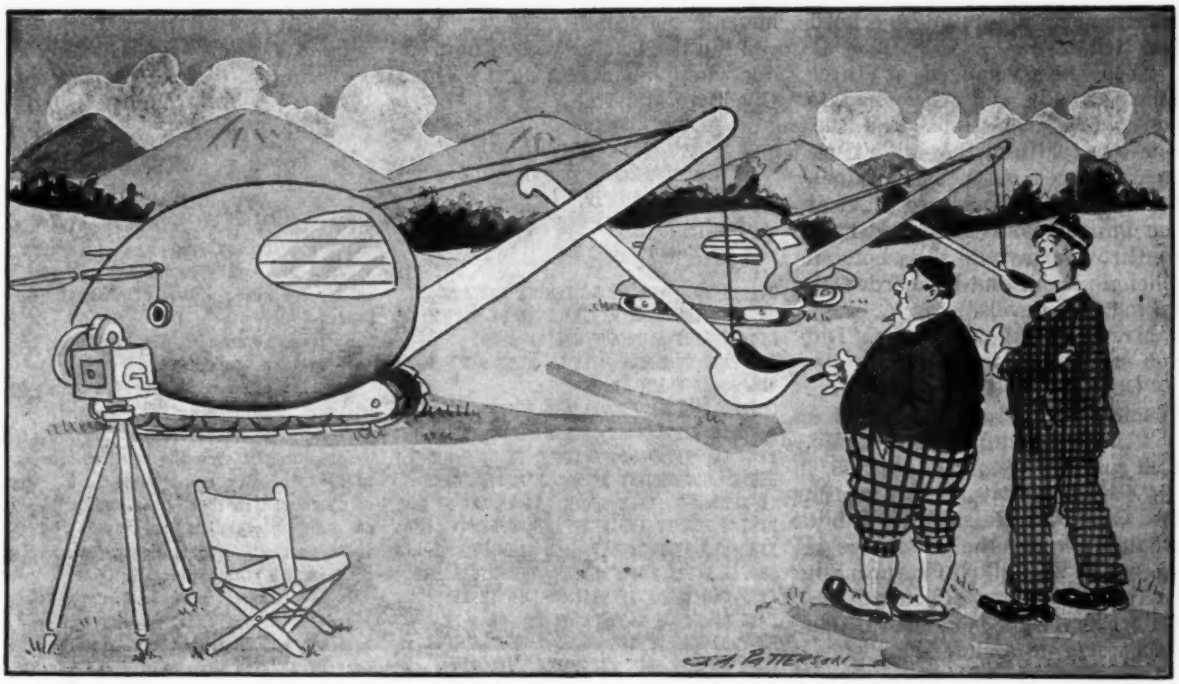
A full line of modern equipment was used at the Nashville, Tenn., Municipal Airport to supplement the labor of 297 men. This equipment included two 1¼ cubic yard revolving gas shovels. These shovels were served by a fleet of three ton dump body, pneumatic tire trucks. A 48-inch elevating grader served by a fleet of five-ton dump body, pneumatic tire trucks. This project also employed two 12-cubic yard cable-control power scrapers. The haul for this equipment was about 750 feet. All this equimpent was supplemented by the necessary grader and bull-dozer units. A small amount of rock has been encountered thus far on this project. A total of 1,250,000 cubic yards of excavation is estimated to be required. A large portion of this has been moved at an average cost of 15 cents per cubic yard. All of the clearing of the site has been completed.

Five hundred and fifty thousand cubic yards of excavation at the Memphis, Tenn., Municipal Airport was handled at an average cost of approximately 13 cents per cubic yard. This was accomplished by the use of an elevating grader served by a fleet of 5 cubic yard, pneumatic tire, dump trucks. The material handled included some boulders.

An illustration of the effective use of modern machinery under the direction of an experienced superintendent is found in the records of the Harrisburg, Pa., Airport. This Works Progress Administration project provided employment for hundreds of men scattered over the entire extension to the field, but these men and their efforts were so well controlled that the entire operation moved forward with ideal economy. The estimated costs of the Harrisburg work included 180,000 cubic yards machine excavation from cut to fill at 71 cents per cubic yard. This included disposal and spreading and involved some rock outcrop. Mechanical equipment included an elevating grader with a fleet of trucks, removing the topsoil from places which were to be buried under an embankment. At the same time in another part of the field, areas which were above the field were being cut down by a group of three steam shovels following each other around the perimeter.



● *These W. P. A. workers are laying asphalt runways for the Tulsa, Oklahoma, municipal airport.*



We've Tried EVERYTHING!

● *"So we streamlined the shovels."*

Salesman Williams finds that his troubles didn't end with the sale of 25 shovels. Directing them in a million dollar movie epic is a job to make strong men weep—but not our William.

By FREDRIC BROWN

Illustrated by J. A. Patterson

Letter from William Z. Williams, Director, Gigantix Films, Inc., on location at Oskiepoosie Valley, Arizona, to D. Itch, President, The D. Itch Digger Company, Circle Center, Ohio:

Dear Mr. Itch:

No doubt you will be surprised to hear from me so soon, and probably you will be equally surprised to learn that already I have run into a bit of difficulty, although we have been on location here only two months.

What with the zeppelin and managing twenty-five steam shovels and a temperamental leading lady, I sometimes think with longing of the days (all twelve of them) when I was a struggling young salesman for your concern, before I persuaded Mr. Gigantix to film "The Epic of Suez" with the twenty-five shovels I sold him for the purpose.

The difficulty is that Mr. Gigantix demands that we have all of the shovels work in unison on the distance shots. He says it looks sloppy otherwise.. And if you have ever tried to synchronize one-yard, three-yard, and five-yard shovels, Mr. Itch, you will know that it is not easy to do, because you can't make the little ones work as slow as the big ones or make the big ones work as fast as the little ones.

● *". . . and engaged him in conversation.*

Now I am wondering, Mr. Itch, if you could make special gear systems for the smaller shovels which would gear them down to keep pace with the five-yard ones.

We've tried everything, Mr. Itch. We started out ten miles down the valley, but the men kept practising to get synchronized and kept digging themselves in so deeply that we couldn't get the right camera angles and having to move on, and they have dug a ditch all the way up here which is ten miles from where we started. The movies are a strange business.

Cordially yours,
William Z. Williams

Telegram from D. Itch, President, the D. Itch Digger Company, to William Z. Williams, Oskiepoosie Valley, Ariz.:

DESIGNING GEAR SYSTEMS PROBABLY SHIP END NEXT WEEK

D ITCH

A telephone (the third from the right) on the desk of D. Itch rang loudly. He picked it up.

"Williams calling from Arizona, Mr. Itch. You'd better get those gears here sooner than you promised, before Mr. Gigantix changes his mind."

"Changes his mind?" echoed Mr. Itch.

"Yes, he's changed it three times already and we've had to stop work each time. You see, someone told him they didn't use steam shovels on the Suez Canal. Sometimes we decide to make it the Panama, but then we'd have to throw away all the shots of Ghengis Kahn and his hordes attaking the shovels."

Mr. Itch swallowed twice. "Did you say Ghengis Kahn?"

"Oh, I know it's an anach . . . anachro . . . "

"Anachronism," prompted Mr. Itch promptly.

". . . but that doesn't worry Mr. Gigantix. He said the public wouldn't know the difference if we made it Julius Caesar. But there is another difficulty, too, Mr. Itch. Our hero can't and won't operate a shovel."

"What can I do about that?"

"Well, we were wondering, Mr. Itch, if you could make us an arrangement so we could operate his shovel by remote control and let him pull at dummy levers."

"Hmmm. . . . It might be done, but it would cost plenty."

"Oh, that's all right, Mr. Itch. Mr. Gigantix doesn't mind expenses. He says this is going to be a million dollar picture, and we haven't spent half that yet. You call me back after you've figured out whether you can do it or not. Goodbye, Mr. Itch."

Telegram from William Z. Williams, Oskiepoosie Valley, Arizona, to D. Itch, President, The D. Itch Digger Company:

DISREGARD QUERY ABOUT REMOTE CONTROL BUT CAN YOU RUSH MANUFACTURE OF ULTRA LIGHTWEIGHT ALUMINUM SHOVEL ABOUT TWO YARD QUESTION MARK WE NEED ONE FOR BIG SCENE ENEMY IN ZEPPELIN GRAPPLES STEAM SHOVEL AND FLIES OFF WITH IT UNTIL HERO CLIMBS FROM SHOVEL INTO ZEPPELIN AND CAPTURES IT STOP WE RENTED GOVERNMENT ZEPPELIN AND WRECKED IT TRYING TO LIFT SHOVEL SO WE ARE PAYING FOR IT AND RENTING ANOTHER ZEPPELIN STOP BELIEVE ALL-ALUMINUM SHOVEL WOULD WORK BETTER FOR THIS SCENE STOP CAN YOU RUSH SHIPMENT IN THREE DAYS QUESTION MARK PAINT IT GREEN IT PHOTOGRAPHS BETTER

WILLIAM Z. WILLIAMS

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Dear Mr. Itch:

Thanks for your telegram. Mr. Gigantix considered your suggestion of two zeppelins, but rejected it as he thought it improbable the hero could subdue the crews of two of them single-handed.

However, as an aluminum shovel would take so long, forget it.

We tried the second zeppelin on a one-yard machine and this time the cables broke and we wrecked the shovel by dropping it thru the roof of the ladies' dressing room, so we have given up the zeppelin idea. Besides, we are now using the ancient Britons as villains who are opposing the Romans in constructing the Appian Way.

It is a sequel to "A Connecticut Yankee in King Arthur's Court" and we call it "A Connecticut Yankee While Rome Burns" and have paid heavy royalties to Alexander Woollcott. In the end, the shovels divert the Tiber River, and put out Rome, and it ends happily.

Cordially yours,
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A telephone (the second from the left) on the desk of Mr. D. Itch jangled and he picked it up.

"This is Williams, Mr. Itch, talking from Phoenix. Things

● *"We wrecked the zeppelin trying to lift the shovel."*

● *"Dropping it through the roof of the ladies' dressing room."*

haven't gone so well the past forty-eight hours."

Mr. Itch grunted noncommitally.

"You see, Mr. Itch, it all started with the airplane raid we staged. After we streamlined the shovels."

"Airplanes?? The ancient Britons?"

"Oh, no, Mr. Itch, of course not. We decided a week ago not to use the ancient Britons, nor even the Appian Way. This was a story of the future, and of a Trans-Atlantis Canal. . . . Oh, no, Mr. Itch, I do *not* mean trans-Atlantic . . . how could there be a trans-Atlantic canal, I ask you. You see a cata-catacl . . .

"Cataclysm?"

"Yes, Mr. Itch, thank you. A cataclysm of nature upheaves the Lost Continent of Atlantis, and the United States of North and South America start the canal . . . and that's why we streamlined the shovels, to make them look futuristic. But . . . the trouble. We blew them all up."

Mr. Itch made a noise not remotely unresembling the D. Itch Model X-t 6-yard shovel.

"You see it was this way, Mr. Itch. When the airplanes flew by overhead, they were to drop bombs which were to miss the shovels. They didn't really drop bombs, of course. We had mines planted, which we exploded by wires, and we had the spots where the mines were located marked, so the shovels could be placed in between the mines. But I got mixed up, and thought the marks were where the shovels were to be placed, so I put each shovel right over a mine. And was that *some* cata- catacl—"

"Cataclysm," prompted Mr. Itch, grimly.

"Thank you," replied Mr. Williams gravely. "That was *some* cataclysm when I pulled the switch, and all twenty-four of those shovels were blown to bits. Even Mr. Gigantix was impressed."

"I'll bet he was," said Mr. Itch. "Did he give you a bonus for that scene?"

"He might have, Mr. Itch, if it hadn't been for one thing. He was a bit stunned at first, but then he said that although it was a bit expensive, it was probably one of the best scenes he had ever filmed. In fact, he didn't fire me until I was forced to tell him that he didn't."

Mr. Itch bit through the end of his cigar and threw it away. "Tell him that he didn't what?" he managed to ask.

"Didn't film it, of course. You see, Mr. Itch, by mistake I forgot and pulled the switch *before* I instructed the cameras to start shooting. And that's why, Mr. Itch, I'm calling you to get my job back as salesman for the D. Itch Digger Com . . . "

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(Continued on page 103)

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(*Continued on page 103*)

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EXCAVATING

FOUNDED 1905

A Monthly Publication

The Excavating Engineer Publishing Co.
South Milwaukee, Wisconsin

F. O. WYSE
Manager

ARNOLD ANDREWS
Editor

D. B. REED, JR.
Associate Editor

JOHN I. MORAVEC
Art Director

RALPH H. DEIHL
Assistant Editor

E. M. HEUSTON
Advertising Manager

And the Floods Came

AS this is written Old Man River is climbing out of his bed all along the Ohio-Mississippi Valley from Pittsburgh to Memphis. Many have met death in the rising waters, hundreds of thousands are homeless, millions of dollars in property has been swept away or destroyed, hunger and pestilence follow in the wake of the swirling floods. And the crest is not yet!

As dirt movers, we all have a vital interest in the great tragedy now being enacted on the river. All along the valley, we built the great walls of earth, concrete and steel that in normal years hold the raging waters harmless. We've built giant spillways with fuse-plug levees that open in times like these to flood thousands of acres and store millions of acre-feet until they can flow more safety toward the Gulf. We are starting great dams and reservoirs along the head waters where melting snows and spring rains can be held for release in dry seasons. Our work has been good work, well planned, fairly let, and honestly executed under the excellent administration of the army engineers. But it hasn't been enough.

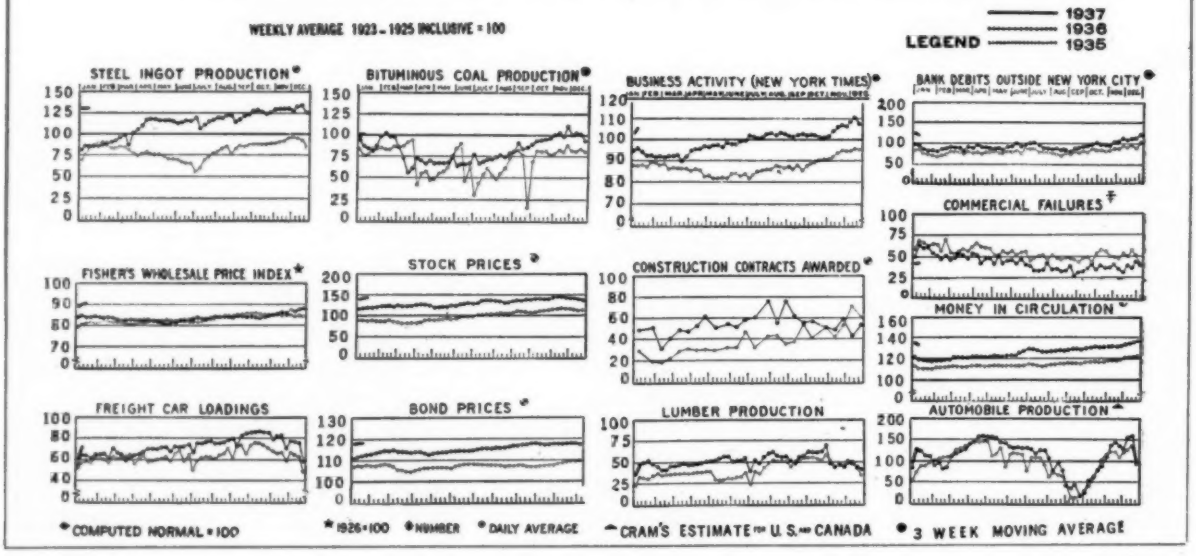
Although this year the trouble has been caused by the unfortunate combination of an extremely warm winter and an excessive amount of precipitation in the form of rain instead of snow, our floods have usually been due largely to the works of man and our policy of cutting timber without reforestation; our present difficulty is danger from conditions that exist because we have never caught up to the changing times. Had this winter been cold, the precipitation the same, and the springtime thaw sudden, we should have had a flood like the present; but had it later in the year—and it would have been largely due to man's lack of foresight. The conditions that bring about quick rises to flood stages move faster than the year-to-year financing of flood control permits us to move. It is time a long-time flood control plan was put into operation with definite yearly commitments of adequate amounts to catch up to the job. There is no economy in piddling along with a minimum of work each year, only to have what has been done swept away every few years by a new record flood stage.

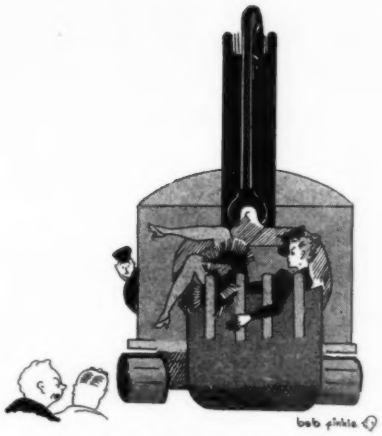
This summer levees will have to be repaired, strengthened, heightened. But the job is bigger than that. More dams and reservoirs need building on the head waters, reforestation on waste lands must go forward on a large scale, land terracing and crop planning for water conservation on the land must play its part. No boon-doggling job this . . . it is supremely necessary and a job than can employ many thousands of men usefully, but will cost billions of dollars. If it is not done, however, the billions will go floating down the river in the floods of next year or the years after, and again the hundred million or so a year that Congress doles out for flood control will be washed away with lives and livestock, the homes and hencoops, the bridges and highways, the goods and machinery now cluttering the rising brown waters that sweep relentlessly down the valley.

Construction Gain of 45% in 1936

THE year 1936 provided a construction total in the 37 Eastern States of $2,675,296,000, a gain of 45 per cent over the figure of $1,844,544,900 for 1935. In-

WEEKLY BUSINESS INDICATORS





● *"Just like Joe—always has to handle everything he likes."*

creases over 1935 were especially pronounced in residential building which showed a gain of 67 per cent in the 1936 figure of $801,623,800 as against only $478,843,100 for 1935. Large increases occurred too, in commercial building, for which the 1936 figure amounted to $249,136,100 as against only $164,479,800 for 1935. For factory building the 37 states' figure totaled $198,019,100 in 1936 as against only $108,858,500 for 1935. Public, educational and institutional building in 1936 amounted to $506,104,500 and compares with only $402,150,300 for 1935.

For Public Works and Utilities the 1936 construction figure reached $920,412,500 as contrasted with only $690,213,200 for 1935. It was in this class of work that the greatest influence of PWA and WPA projects was centered.

The December 1936 total for construction of all descriptions in the 37 Eastern States amounted to $199,695,700 and compares with $208,204,200 for November 1936 and $264,136,500 for December 1935. The loss from December 1935 was entirely due to a shrinkage in public projects of every description.

Residential construction started in December 1936 amounted to $65,487,300 as against $68,440,700 for November 1936 and $45,140,100 for December 1935.

We've Tried Everything

(*Continued from page 101*)

the receiver upon the hook, and for a long, long moment sat and stared at it before he turned back to his work and absent-mindedly tried to put his signature upon a franchise with his cigar-lighter.

Henry R. Burt

A CO-FOUNDER, with the late Daniel A. Garber and John B. Wolff, of his company in 1904, Henry R. Burt, President of the North-Eastern Construction Company, died suddenly at his New York Home, 970 Park Avenue, on January 1st.

Mr. Burt was born in New York City on June 13, 1879 and prepared for college at the Drisler school. He attended the Columbia University School of Engineering and was a member of the Class of 1901.

Succeeding Daniel A. Garber in the presidency of his company in 1928, he directed its activities in the construction of a great many buildings and engineering projects throughout the Eastern Seaboard and as consulting engineers to various utilities companies in the evaluation of physical properties.

In 1908 Mr. Burt married Miss Clara Stratton MacGregor, who died in 1932. Surviving are his second wife, Mrs. Maggie Z. Horn Chandler Burt, whom he married in 1935, and an infant son, Henry R. Burt, Jr.

John B. Wolff has been elected President of the North-Eastern Construction Company to succeed Mr. Burt.

Letter from Mr. William Z. Williams, Hotel Wonder, Phoenix, Arizona, to Mr. D. Itch, President, the D. Itch Digger Co.

Dear Mr. Itch:

It is rather embarrassing to have to write this letter to terminate my employment with you so shortly (in fact, less than four hours) after I telephoned you. Incidentally, you have a very dumb switchboard operator. When our connection was broken, I phoned back and she told me you were in Europe, and she was too dense to grasp the point when I patiently tried to explain that I had just been talking with you.

However, instead of wasting more time, I wanted to start selling right away, so I left my room, and in the lobby of the hotel I saw a gentleman with whom I had bent my elbow a bit the previous evening in the hotel bar, and engaging him in conversation, I learned some very interesting facts.

As I have explained to you, in trying to synchronize the shovels and in filming various scenes, the twenty-five shovels had dug a ditch ten miles long, which is within a mile of being the full length of Oskiepoosie Valley. Now the fertile Poosieoskie Valley, where the finest eggplants in the world are raised, lies at one end of our valley, and the Dead Cow River flows past the other end. And here is the point, Mr. Itch: the drought has greatly hurt the eggplant crop, and in digging a ditch for the picture, we had almost completed what can be made into a perfect irrigation canal to feed the Poosieoskie Valley from the Dead Cow.

And when I explained that I had dug the canal, Mr. Burbark (for such was the gentlemen's name and he is president of the Eggplant Growers' Association) hired me on the spot, at what I must admit is a quite satisfactory salary, to complete the canal.

I explained my connection with you and he said that I might as well have the commission on their order for excavating equipment, so I am enclosing his order herewith for two shovels, one dragline and two bulldozers. The taking of the order, is of course, my last official act as a salesman for your company, as I am now superintendent of the Oskiepoosie Irrigation Alliance, Construction Department.

Cordially yours,
William Z. Williams

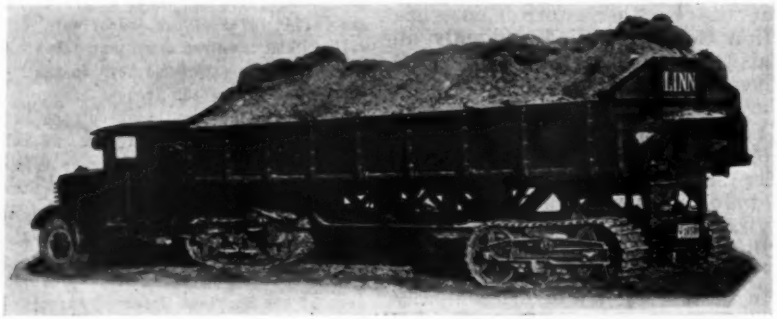
P.S. In acknowledging the order, Mr. Itch, please explain to me, if you will be so very kind, what a bulldozer is. If the latter is to be pulled by bulls, we have some of the finest cattle in the country here in Arizona, so I anticipate no difficulty. However, as superintendent, it would probably be well for me to have full data in advance, as to how many bulls, etc.

W.Z.W.

● *". . . as to how many bulls."*

EQUIPMENT

You Ought to Know About



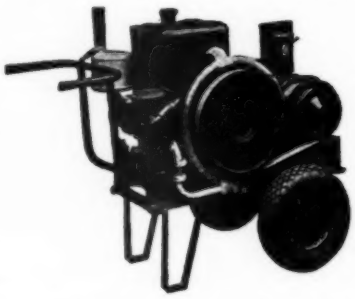
Linn Tractors

THE Linn Manufacturing Corporation, Morris, N. Y., have just announced two additions to their standard line of tractors. In the model L-37, the body capacity has been increased to 12-15 yards. To compensate for this extra capacity, all body and chassis parts have been strengthened. The fundamental design features, however, have been retained. These include the patented flexible traction unit for positive footings, extra wide end dump bodies with dumping angle of 50 degrees, automatic downfold tailgates, and high speed forward and reverse driving. Power is supplied by a 6-cylinder, 610 ft. lb. torque Hercules gasoline engine with Diesel motor optional.

The other new unit, illustrated here, Model 37-T, is a combination Tractor-Trailer with body capacity of 25-30 yards, and is offered for contracting, mine stripping, and other haulage jobs where huge capacities are essential. The trailer body is two way dumping with heavy duty under body hoists and automatic down foldside gates. The dumping angle is 50 degrees. This unit is also furnished with platform and stake body for general hauling, and logging bunks for hauling long length logs.

New Portable Electric Plants

ROAD builders, wrecking crews, bridge erectors, steamship lines, contractors and others requiring a dependable supply of electric current for use in remote places where central station power is not available will be interested in the new portable Electric Plants manufactured by the Ready-Power Co. of Detroit,



makers of international Electric Plants.

These new portable plants are made in three different types; all of them readily transportable; and each furnishing enough continuous power to light twenty 50-watt lamps or their equivalent, 1000 watts of power. They are powered with a slow speed, heavy duty, water cooled International engine.

Ingersoll-Rand Drifter

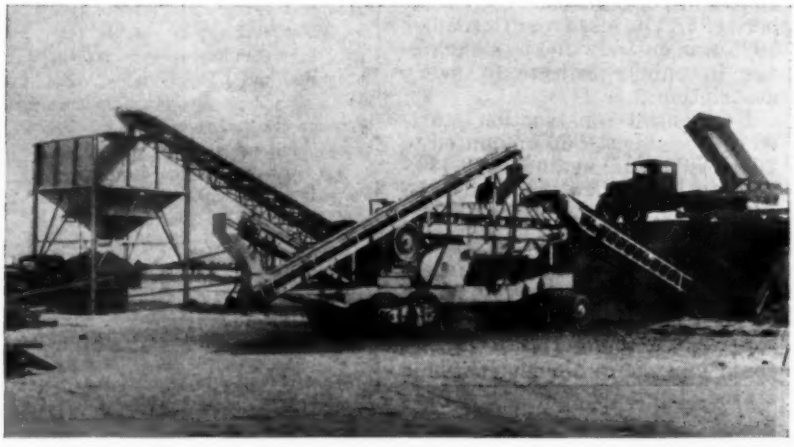
INGERSOLL-RAND'S latest contribution to the mining field is their new 150-lb. drifter—the "DA-35"—which, they state, is "the fastest drill Ingersoll-Rand has ever built," and which they recommend for any heavy drifting job.

This extra drilling speed and the drills' low air consumption have been largely achieved by means of a new double-opening, direct-flow valve of small diameter, light weight and short travel.

Portable Gravel Plant

LATEST addition to the Iowa Manufacturing Company line is a super tandem gravel plant. New roller bearing unit is primary crusher; roller bearing roll unit, secondary crusher. Screening unit is an Iowa-Symons vibrator screen.

Mounted on solid or pneumatic tires, the new super-tandem plant is equipped with roller bearings throughout, and features straight or swivel type feed conveyor. The plant is available in a range of sizes. Detailed specifications and photographs are included in a circular which will be furnished on request to the Iowa Manufacturing Co., Cedar Rapids, Iowa.

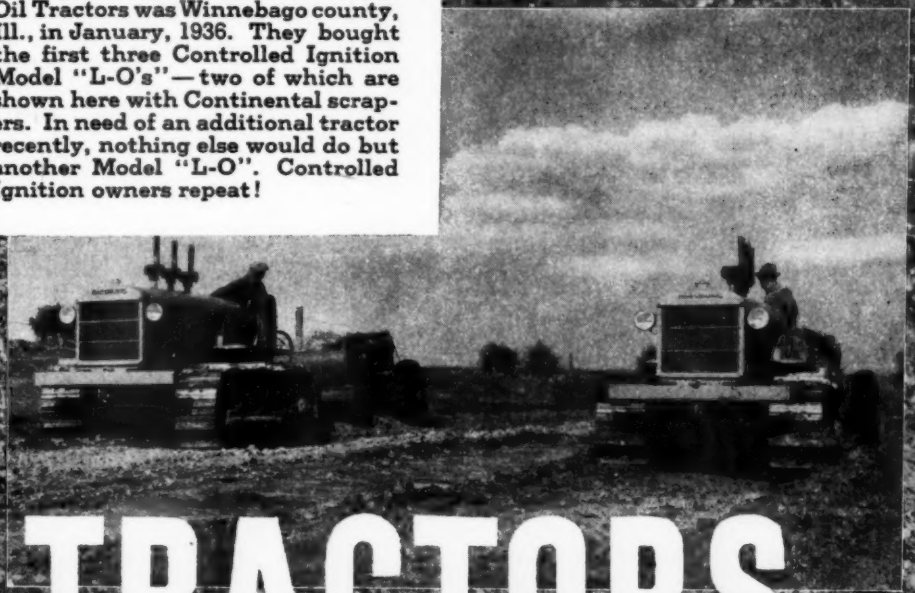


NERS...

REPEAT

WINNEBAGO COUNTY "REPEATS"

First purchaser of current model Oil Tractors was Winnebago county, Ill., in January, 1936. They bought the first three Controlled Ignition Model "L-O's"—two of which are shown here with Continental scrapers. In need of an additional tractor recently, nothing else would do but another Model "L-O". Controlled Ignition owners repeat!



OIL TRACTORS

More on Highways

A. R. B. A. Hold Successful New Orleans Meeting

BETWEEN seven and eight thousand persons attended the convention of the American Road Builders Association held in New Orleans, Louisiana, January 11th to 15th.

One hundred and twenty six distributing companies presented 23,000 square feet of exhibits in a total hall space of some 45,000 square feet. Warm summer weather with the temperature covering between 70 and 80 degrees Fahrenheit formed a pleasant change for many a Northern visitor. Some 40 foreign delegates, principally from Mexico and South American countries spent the major part of the five days at the meeting.

It will be remembered that in the early days of the American Road Builders Association its objectives might have been keynoted with the phrase "Pull U. S. Out of the Mud." The "theme song" of this meeting in New Orleans was "safe highways".

The following officers were elected for the year 1937-1938: President, Willard T. Chevalier; Vice President Northeastern district, Paul B. Reinhold; Vice President Central district, Lion Gardiner; Vice President Western district, Stanley Abel; Vice President, Southern district, Alex Hancock; Treasurer, James H. MacDonald; Directors, Robert B. Brooks, Paul L. Griffiths, A. Lee Grover, J. D. Manley, W. A. Olen, J. E. Pennybacker and H. G. Sours.

South Carolina Highways

DURING the fiscal year ended June 30, 1936, the State Highway Department of South Carolina advanced the State Highway System of South Carolina by the completion of approximately 195 miles of hard surfacing. A comparison of the status of the System on June 30, 1935 and June 30, 1936, is as follows:

Completed:	Miles June 30 1936	Miles June 30 1935
Standard pavement	2,417.69	2,400.82
Bituminous surfacing	1,724.01	1,545.112
Improved earth type	1,141.73	1,243.05
Sub-totals	5,283.43	5,188.982
Incomplete Portions Projects		
Under Contract:		
Standard paving	19.51*	.1
Bituminous surfacing	37.76	172.674
Improved earth type	147.72	11.6
Sub-totals	187.48	184.374
Unimproved	666.70	633.15
TOTALS	6,137.61	6,006.506

*Includes 17.51 miles of widening existing pavement and relocations of existing pavement. The totals include this mileage in "Completed Standard Pavement."

The total expenditures for construction for the year was $3,288,771.51. Expenditures for maintenance amounted to $1,733,618.02.

For the most complete published forecast of the 1937 highway program of the states and the federal government, we suggest you see EXCAVATING for January, 1937.

The 1936 General Assembly authorized a two-year construction program estimated to cost approximately $9,500,000.00. Funds for this program are provided from State bonds and regular Federal Aid for the years ending June 30, 1936 and June 30, 1937. Over fifty per cent of the projects for this program have been let to contract and others will be let just as rapidly as plans are completed. A summary of the projects, for which funds have already been provided, to be let as soon as plans are completed, is as follows:

Federal Aid and State Projects authorized by 1936 General Assembly	$4,000,000.00
Federal Works Program Highway and Grade Crossing Projects	1,200,000.00
Other projects to be financed pursuant to reimbursement agreements with counties	800,000.00
Total	$6,000,000.00

$2,500,000 for Roads In Public Lands Areas

THE apportionment of $2,500,000 has been announced for the construction of main roads through unappropriated or unreserved public lands, non-taxable Indian lands, or other Federal reservations other than national forests during the fiscal year 1938. Authorizations for this class of work were first made in 1930 and the new apportionment brings the total funds apportioned to date to $17,500,000. Previous authorizations have provided for the construction of more than 1,400 miles of road.

The new apportionment is as follows:

Arizona	$ 378,077
California	235,638
Colorado	88,688
Idaho	122,609
Montana	137,774
Nevada	560,201
New Mexico	206,844
North Dakota	32,611
Oklahoma	28,935
Oregon	168,367
South Dakota	54,497
Utah	256,296
Washington	38,349
Wyoming	191,114
Total	$2,500,000

Federal Highway Fund Appointment

Fiscal Year 1938

State	Regular Federal Aid	Secondary or Feeder Roads	Grade Crossings	Total
Alabama	$2,664,693	$532,939	$1,015,170	$4,212,802
Arizona	1,829,952	365,990	314,594	2,510,536
Arkansas	2,187,752	437,550	893,403	3,518,705
California	4,858,220	971,644	1,874,656	7,704,520
Colorado	2,336,054	467,211	657,357	3,460,622
Connecticut	805,426	161,085	426,784	1,393,295
Delaware	625,000	125,000	250,000	1,000,000
Florida	1,704,765	340,953	712,816	2,758,534
Georgia	3,233,279	646,656	1,223,099	5,103,034
Idaho	1,570,687	314,137	418,115	2,302,939
Illinois	5,238,798	1,047,760	2,644,980	8,931,538
Indiana	3,149,011	629,802	1,308,113	5,086,926
Iowa	3,291,322	658,264	1,410,787	5,360,373
Kansas	3,374,126	674,825	1,307,669	5,356,620
Kentucky	2,349,316	469,863	919,174	3,738,353
Louisiana	1,829,490	365,898	799,226	2,994,614
Maine	1,122,670	224,534	352,468	1,699,672
Maryland	1,043,938	208,787	519,993	1,772,718
Massachusetts	1,769,936	353,987	1,047,500	3,171,423
Michigan	3,893,528	778,706	1,664,807	6,337,041
Minnesota	3,495,178	699,036	1,342,809	5,527,023
Mississippi	2,247,708	449,542	806,707	3,503,957
Missouri	3,877,890	775,578	1,528,920	6,182,388
Montana	2,621,728	524,346	671,204	3,817,278
Nebraska	2,641,423	528,285	892,976	4,062,684
Nevada	1,632,385	326,477	250,000	2,208,862
New Hampshire	625,000	125,000	250,000	1,000,000
New Jersey	1,701,826	340,365	997,689	3,039,880
New Mexico	2,040,685	408,137	432,291	2,881,113
New York	6,258,857	1,251,771	3,424,399	10,935,027
North Carolina	2,998,371	599,674	1,244,662	4,842,707
North Dakota	1,996,414	399,283	803,068	3,198,765
Ohio	4,640,344	928,069	2,141,704	7,710,117
Oklahoma	2,995,620	599,124	1,156,175	4,750,919
Oregon	2,092,368	418,474	588,377	3,099,219
Pennsylvania	5,434,356	1,086,871	2,905,671	9,426,898
Rhode Island	625,000	125,000	250,000	1,000,000
South Carolina	1,722,188	344,438	752,928	2,819,554
South Dakota	2,084,100	416,820	694,096	3,195,016
Tennessee	2,681,110	536,222	958,753	4,176,085
Texas	7,957,610	1,591,522	2,724,825	12,273,957
Utah	1,447,780	289,556	322,885	2,060,221
Vermont	625,000	125,000	250,000	1,000,000
Virginia	2,328,369	465,674	941,656	3,735,699
Washington	2,002,877	400,575	767,991	3,171,443
West Virginia	1,390,447	278,089	671,712	2,340,248
Wisconsin	3,107,058	621,411	1,252,871	4,981,335
Wyoming	1,600,350	320,070	344,961	2,265,381
District of Columbia	.....	.....	250,000	250,000
Hawaii	625,000	125,000	250,000	1,000,000
Puerto Rico	625,000	125,000	369,959	1,119,959
Total	$125,000,000	$25,000,000	$50,000,000	$200,000,000

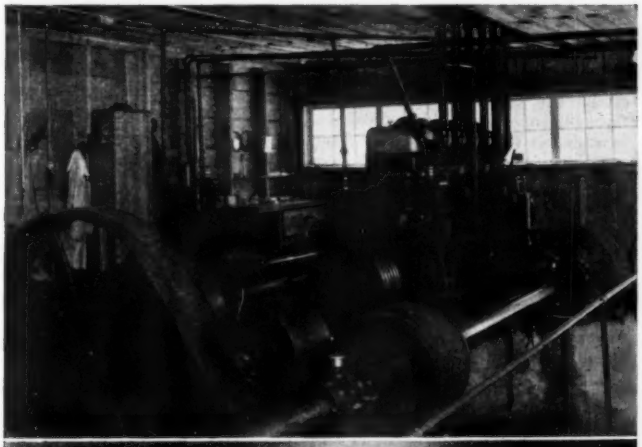
Atlas Diesels Power Skagit Talc Mine

The Skagit Talc Mine at Sedro-Woolley, Washington, is another of those interesting enterprises in out-of-the-way locations, where Atlas Diesel power is utilized to make a variety of products available to the world.

Here they mine a wide range of talc and soapstone. A great portion of their production has gone to the Kraft paper mills of the country in the form of furnace lining blocks. The construction industry buys building facings and fireplace fronts from Skagit Talc, and their soapstone griddles make hot cakes to a queen's taste.

Commercial production was begun in 1933, with a wood-fired steam engine. In 1936 when they were ready to start capacity production, they installed a 135 H.P. Atlas Diesel to operate the plant and mine equipment. This engine has reduced their power generating costs many times over compared to the steam engine, which is now used to saw mine timbers.

The Atlas Diesel is a 6 cylinder model and through Texropes it drives a line shaft from which are driven a 225 cu. ft. per minute air compressor, a 35 K.W. Alternator and a 5 H.P. generator. Compressed air is used to operate a coal cutter used in opening up new underground workings. The alternator operates the mine saw and the generator supplies lighting current. A second line shaft in the mill is belt-driven from the first shaft. Three mill saws are belted to it. The Atlas Diesel carries the entire load easily, smoothly, and economically.



ATLAS IMPERIAL DIESEL ENGINE CO.
Oakland, California Mattoon, Illinois

ATLAS IMPERIAL

For your convenience in writing to Atlas Imperial Diesel Engine Co., you will find a card bound in this issue.

SHOTS
from the Firing Line

National Crushed Stone Association Holds Successful Meeting at Cincinnati, Ohio

WINDING up a most successful meeting—their twentieth Annual Convention—three days before the flood of the past few weeks reached its crest, the members attending the National Crushed Stone Association convention at Cincinnati, Ohio went home with the feeling of having spent a very interesting and instructive three days; and most of them reading, during the next few days of the flood development in that city were not a little pleased at having left when they did.

Thirty-four members of the Manufacturers Division presented an interesting exhibit for the attention of the active members of the association.

Mr. H. E. Rodes of Nashville, Tennessee was re-elected president of the Association; Mr. Wm. E. Hilliard of New Haven, Connecticut was re-elected treasurer.

Progress on All-American Canal

WITH 56.2 miles of canal excavated, work is progressing at top speed on the 80-mile-long All-American Canal, under construction by the Bureau of Reclamation in southern California.

Mild weather along the lower reaches of the Colorado River makes winter the best season for construction in that area. As a consequence 2,027 men are now employed on the PWA financed All-American Canal, the highest number yet attained, while work is being curtailed by freezing weather on some projects in other parts of the west.

"Progress of the work on the All-American Canal and the Imperial Dam and desilting works at its head on the Colorado River is most satisfactory," John C. Page, Acting Commissioner of the Bureau of Reclamation, said in a report to Secretary of Interior Harold L. Ickes.

A total of 43,900,000 cubic yards of material has been moved to date in digging this, the largest irrigation ditch in America. This material, if piled on an ordinary city block, would form a solid column matching in height the second tallest peak in Rocky Mountain National Park, Mummy Mountain, 13,413 feet high.

Construction of the Imperial Dam and desilting works, considerably ahead of schedule, is 47 percent complete with only 39 percent of the time allotted the contractor elapsed.

The entire length of the canal is either completed or under contract. Excavation is proceeding at a rate in excess of 1,000,000 cubic yards a month.

In addition many large canal structures are under construction. The siphons which will carry flood waters from Unnamed, No. 120 and No. 424 washes across the canal are nearing completion and that at Picacho wash is 28 percent complete. Six other such siphons are well under way. The railroad bridge across the canal west of Yuma, Arizona, has been completed and the highway bridge near that point is far advanced.

Bids will be asked shortly on six or more additional large structures along the canal.

The All-American Canal, authorized by the Boulder Canyon Project Act together with Boulder Dam, will serve the Imperial Valley in California. The present main canal serving this valley runs through Mexican territory for more than 50 miles.

The desilting works at the head of the canal, being constructed as a part of the Imperial diversion dam contract, will remove from the irrigation water its present heavy silt load. Imperial irrigators spend more than $1,000,000 a year in cleaning silt from their canal system at present.

• *Looking East along the All-American canal, this view shows part of the work east of Calexico. The walking dragline in the foreground is Boyce & Igo's 12-yard Bucyrus-Monighan.*

Central Valley Project Bids

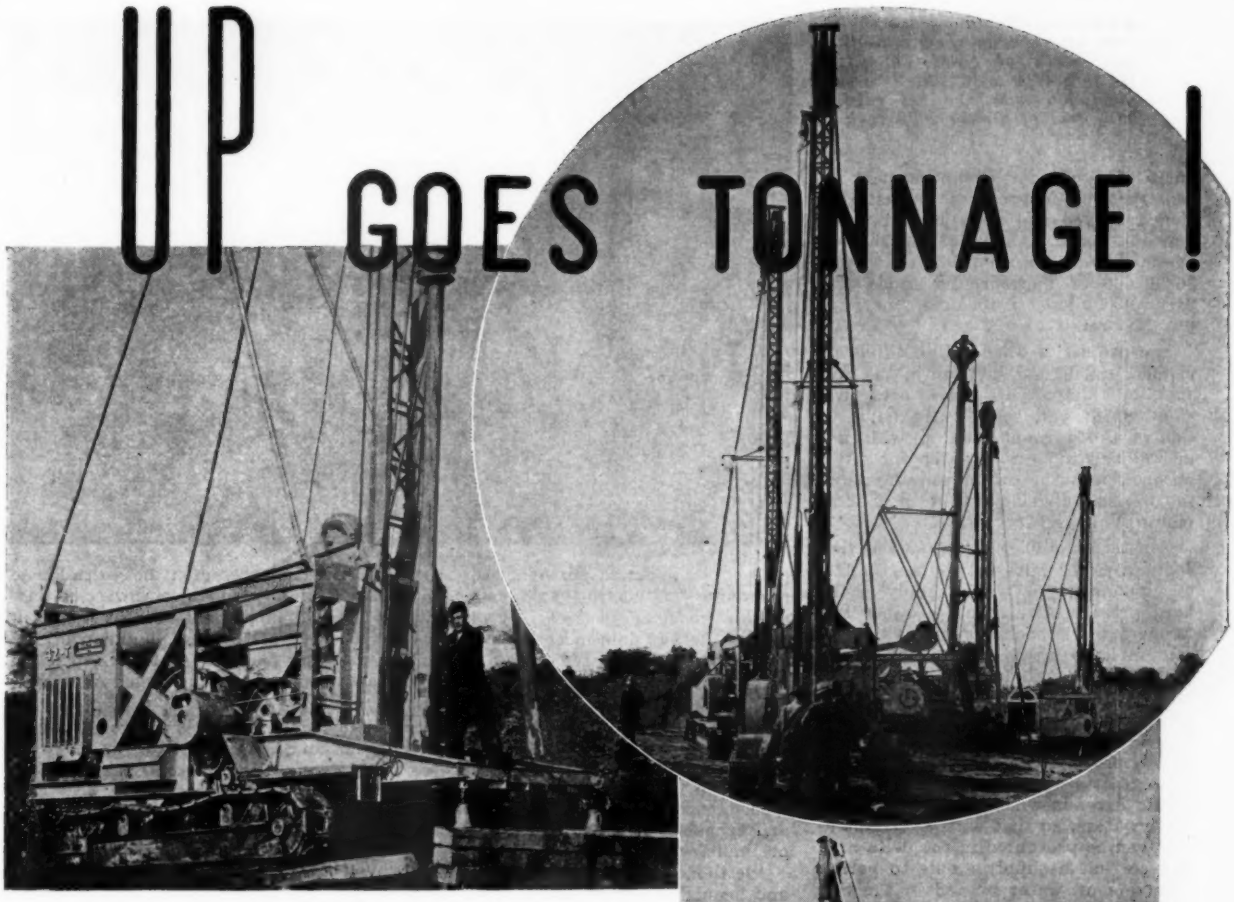
THE first construction contract on the Central Valley Federal reclamation project in California, that covering four miles of the Contra Costa Canal, will be advertised for bids immediately.

The Denver engineering office of the Bureau has been informed that the way has been cleared for the advertisement of the work and the call for bids will be issued by that office within a few days.

The Central Valley project is designed to conserve and redistribute the waters of the Sacramento and the San Joaquin Valleys, the two great interior valleys of California, in order to relieve a desperate situation in southern San Joaquin Valley, where thousands of acres of highly developed agricultural lands are reverting to desert because of exhaustion of underground water supplies, and to correct a critical condition in the rich San Joaquin-Sacramento Delta region, where intrusion of salt water from San Francisco Bay is threatening the fertility of about 400,000 acres of fine farms.

The project was authorized in 1935 by President Roosevelt with the allot-

UP GOES TONNAGE!



. . . with Bucyrus-Armstrong
BLAST-HOLE DRILLS

Production capacity goes *up*, and preparation costs go *down* per ton of rock prepared when Bucyrus-Armstrong Blast-Hole Drills get on the job. For speed of drilling, ease of handling, economy of operation, ready mobility, and all-around drilling performance, Bucyrus-Armstrong Drills are the choice of up-to-date blast-hole drillers everywhere. Illustrated here are:

- **42-T (upper left) Handles 6,000 pounds of tools. Drills 9" to 12" holes. Telescoping derrick, 47½' high. Crawler mounted.**
- **29-T (group of drills, upper right) Handles 3,000 pounds of tools. Drills 6" to 10" holes. Derrick 38' high. Crawler mounted.**
- **26 (lower right) Handles 1,600 pounds of tools. Drills 4" to 8" holes. Derrick 32' high. Crawler mounted.**

701

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EXCAVATING, DRILLING AND MATERIAL HANDLING EQUIPMENT . . . SOUTH MILWAUKEE, WIS., U.S.A.

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● *Koehring Dumptors are shown here at work on road relocation just south of Coon Valley in Western Wisconsin. This is a cut-fillled job with the cut raising 99½ feet of almost solid rock.*

ment of funds for commencement of construction. Congress at its last session approved and appropriated funds for the work. About $11,400,000 is available for initiation of the work, $6,900,000 of appropriated funds and $4,500,000 alloted from emergency appropriations.

The project is divided into three divisions: the Friant division in the San Joaquin Valley; the Contra Costa division, which will serve farm lands in Contra Costa county and provide domestic and industrial water for cities on the south side of Suisun Bay; and the Kennett division end of the Sacramento Valley.

Construction of a dam on the San Joaquin River and distributary canals to supplement the water supply of the hard pressed citrus fruit growers and farmers in the San Joaquin Valley is contemplated in the Friant division. In the Contra Costa division a canal will be constructed leading from Rock Slough to the vicinity of Martinez. A large storage dam is contemplated in the Kennett division for the purpose of regulating the flow of the Sacramento River in which there are surplus flood waters, so that salt water intrusion can be prevented in the delta area and so that a supply ample to permit diversion of water needed in the San Joaquin Valley will be available throughout the entire year. Flood control benefits will accrue and navigation will be improved. A hydro-electric development also is contemplated in connection with the dam in the north.

"Intensive pre-construction work has been in progress for many months," Mr. Page said. "The preliminary engineering work on all divisions of the project is about complete. The only remaining engineering problem of importance is final selection of a damsite for the storage dam in northern Sacramento Valley. Extensive examination of several sites, including the Kennett, Table Mountain and Baird sites, the latter on the Pit River and the others on the Sacramento River, are virtually complete. The Bureau expects to be in a position very shortly to make a final determination of the most practical and economic site, thus completing all preliminary engineering work.

"Settlement of water right problems and acquisition of rights of way have occupied both the Bureau of Reclamation and the California State Water Project Authority, which is conducting negotiations in these matters for the Bureau. Progress is being made in this regard, and I am hopeful that soon other work can be advertised."

Seminoe dam, a 265 foot concrete arch structure designed to impound more than a million acre-feet of water, is being constructed on the North Platte River about 60 miles southwest of Casper, Wyoming. Contract for the construction of this dam, another of the important features of the Casper Alcova project, was awarded one year ago.

During the first year of construction, roads and power-lines to the site were completed; camps were established; a permanent Government city was constructed and a good start was made on the dam itself. The contract calls for completion of this dam by March 23, 1939. It is approximately twenty per cent complete at this time.

The river channel below the dam has been widened and deepened for a distance of 2,100 feet. An aerial tram to carry aggregate in buckets with a capacity of 32 cubic yards has been completed. It extends 2¼ miles between the screening plant and the concrete mixing plant, which is situated on the canyon wall above the damsite.

The spillway and diversion tunnels have been holed through and excavation on these features probably will be completed soon. It is expected that excavation of the dam abutments and construction of cofferdams will be completed so that the river may be diverted by September 1. Excavation for the dam foundation will then proceed and a contractor should have the foundation rock completely exposed by February 1, 1938.

More than 350 men are working this winter on the Seminoe dam and in the first year nearly 1,250,000 man hours of employment was given.

The Casper canal, the third major feature of the project, will extend from Alcova dam sixty miles to the 35,000 acres to be irrigated in the vicinity of Casper. The canal itself is being excavated by Government forces while

● *Cleveland Cliffs Iron Company uses this Bucyrus-Armstrong 29-T blast hole drill in its iron mining operations at Ishpeming, Mich.*

WITH 5 EXCLUSIVE FEATURES PROVIDING TREMENDOUS CAPACITY AND EFFICIENCY

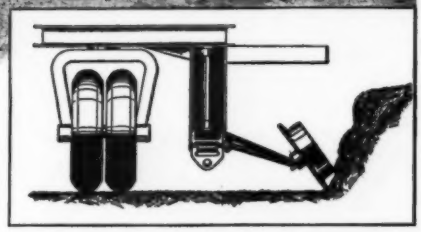
1. Size of furrow slice varied instantly—made wide or narrow without disturbing correct position of plow with relation to carrier bedframe—by *Adjustable Furrow Wheel.*

2. Hardest soil easily penetrated to any depth . . . by power-operated *stiff-leg plow.* Being hydraulically controlled, plow can exert tremendous downward pressure . . . will not ride up or down where the tough job demands a firm cutting edge . . . yet can be "floated" instantly.

3. Dirt handled in larger quantities, at higher belt speeds, at steeper angles, and without power-consuming friction, by *Trough-type Belt.* Heaps material toward center. No sideboards needed.

4. Firm foundation for machine . . . better and firmer support for loaded carrier . . . right-angle turns in either direction, within a shorter turning radius . . . made possible by unique *Three-wheel construction.*

5. Carrier and plow adjusted with amazing speed and without effort . . . by A-W *Hydraulic Power Control.*



Here's how the A-W Elevating Grader maintains a uniform furrow slice of any desired width. Note how hydraulically controlled furrow wheel rides at base of cut—a touch of the hydraulic control lever permits the furrow cut to be narrowed or widened without disturbing the correct position of plow with relation to carrier bedframe . . . maintaining maximum plow output at all times.

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tunnels on the canal route, aggregating more than two miles in length, are being driven under contract. The contractor on tunnel No. 6, the longest one of the group, has holed through and work is in progress on excavating this tunnel to its full diameter preparatory to lining it with concrete. These tunnels are 41 per cent complete.

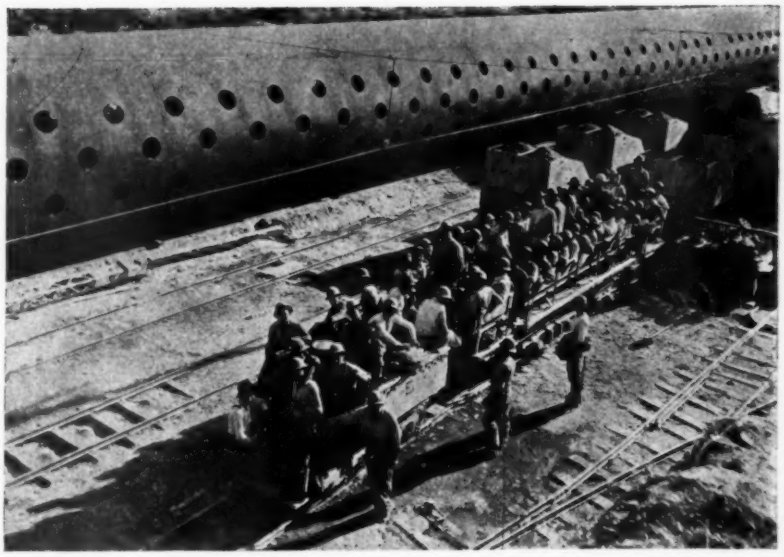
A total of fourteen and one-half miles of canal have been excavated by Government forces, which have moved 2,113,000 cubic yards of earth.

San Jacinto Tunnel

By Vollie Tripp

THE Colorado River Aqueduct, stretching from the eastern boundary of the state to within a few miles of the Pacific, entails a cost more than three times greater than Boulder Dam itself, and in some respects presents greater engineering obstacles. Of the more than a hundred miles of tunnels in its length the longest is the San Jacinto unit, 68,866 feet. This bore, entering the mountain near Cabazon, on the desert side, and making its exit near the town of San Jacinto, has brought a few extra wrinkles to the engineers' brows.

The biggest problem in the San Jacinto unit has been water. At times water has spurted from the sides and ceiling of the bore with a pressure sufficient to force steel out of the drill holes. The drillers manning the "Christmas tree" up in the headings have borne the brunt of the battle, sometimes working in veritable cataracts. Such conditions call for the utmost hardihood and stoic persistence. As one of them explained, "You just go on like it wasn't there." The flow of water has been greatly reduced as some of the largest fissures have been cemented off, but it still continues to be a problem. When I visited the tunnel recently, it was discharging about 13,000 gallons per minute.



• *Going on shift at San Jacinto tunnel. Chief problem encountered in putting in this longest of the Colorado River Aqueduct tunnels was water spurting from sides and ceiling of the bore.*

Aside from drilling in the water logged headings the excavating problems in the San Jacinto unit have not been out of proportion to its size and length. The light granite formation is easily drilled with conventional type bits. Usually 18 holes are drilled in a face. Holes average about 17 feet in length. 40 and 60 per cent dynamite is used, a pound of dynamite for each foot of hole. (This may vary.) The holes are shot progressively from the center outwards.

Several types of hammers are used on this job. Air at 120 pounds is supplied through a six inch line by Ingersoll-Rand and Sullivan compressors, which have a capacity of 1000 cu. ft. per minute.

When the bore has been mucked out and trimmed it is timbered. The main timbers, or "crown bars," are 10 inches by 12 inches, spaced about two feet apart. Over the timbering heavy galanized wire is nailed and the entire surface given a gunite coating. This lining is not removed from the tunnel, the permanent concrete lining being formed inside it.

The steel form for the tunnel lining is built in sections, each 20 feet long. Fifteen of these sections are bolted together, making 300 feet of form in all. The form is of the collapsible type. It is floated into position on a machine the boys call a "strong back," where powerful steam boat jacks lift it up and expand it outwards to the proper size. The space between the form and the gunite lining is then pumped full of concrete and allowed to set, when the jacks are released and the form moved ahead to the next location. Any leaks which have not been sealed are drilled and grouted. Into one such hole 70 sacks of cement grout were pumped.

All power for the San Jacinto tunnel is electric. Electric stopers and spaders are used to load the muck cars. Both trolley and battery driven locomotives are employed. The battery locomotive, while more expensive to operate, insures motive power within the

• *San Jacinto tunnel on the Colorado River Aqueduct. Ventilating pipes are seen at right.*

RED ARCH dragline buckets give you BIG OUTPUT, faster digging and longer service for a safe margin of profit. The lip is extra strong. The rigid arch holds its shape under hard usage. Every pound of excess metal is eliminated by scientific, modern design and stronger, lighter steels. Write for bulletins on these sturdy, fast-filling, Red Arch buckets. Available in three styles—sizes from ⅜ to 14-yard capacity.

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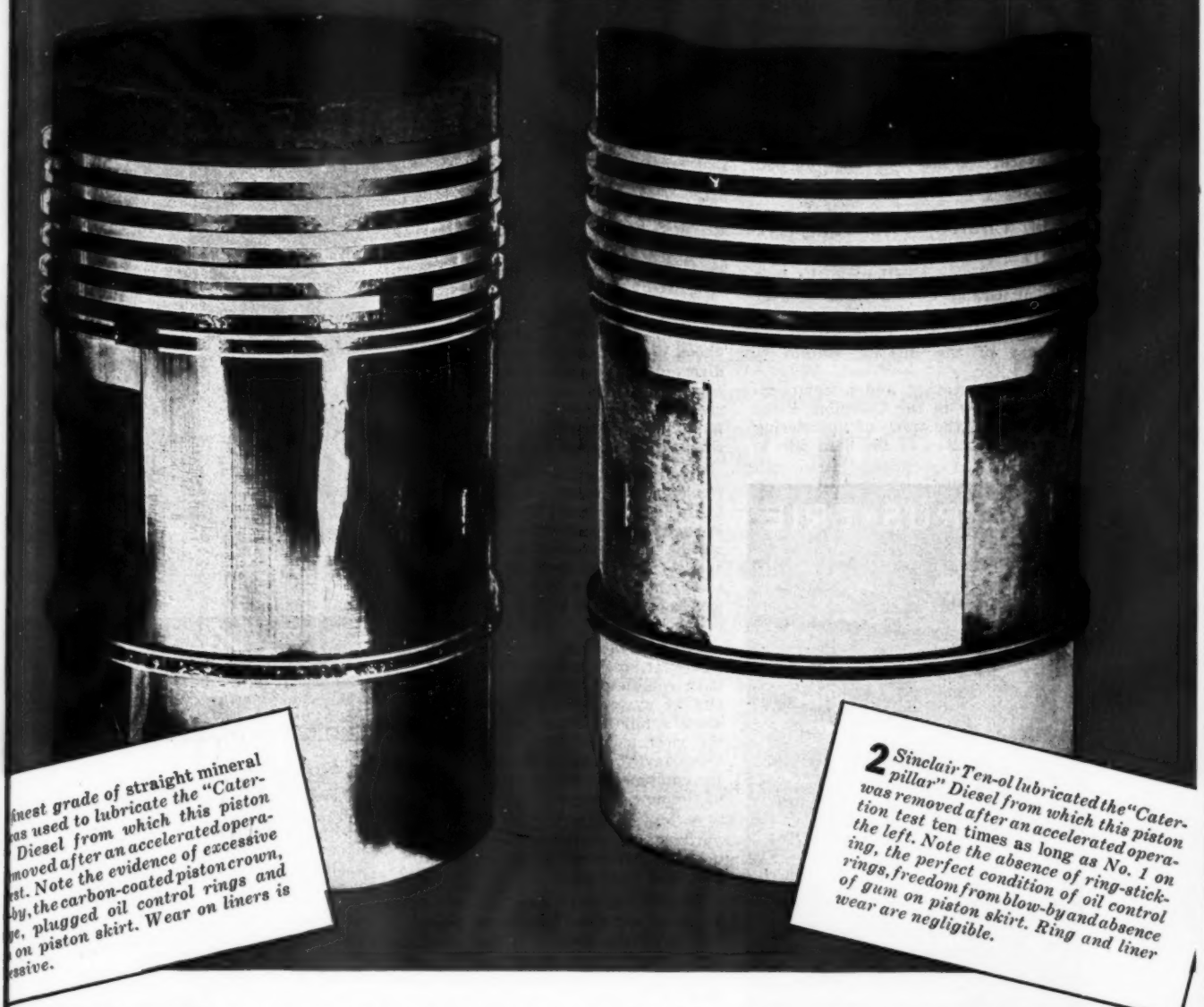


finest grade of straight mineral as used to lubricate the "Caterpillar" Diesel from which this piston removed after an accelerated operation test. Note the evidence of excessive blow-by, the carbon-coated piston crown, gum, plugged oil control rings and varnish on piston skirt. Wear on liners is excessive.

2 *Sinclair Ten-ol lubricated the "Caterpillar" Diesel from which this piston was removed after an accelerated operation test ten times as long as No. 1 on the left. Note the absence of ring-sticking, the perfect condition of oil control rings, freedom from blow-by and absence of gum on piston skirt. Ring and liner wear are negligible.*

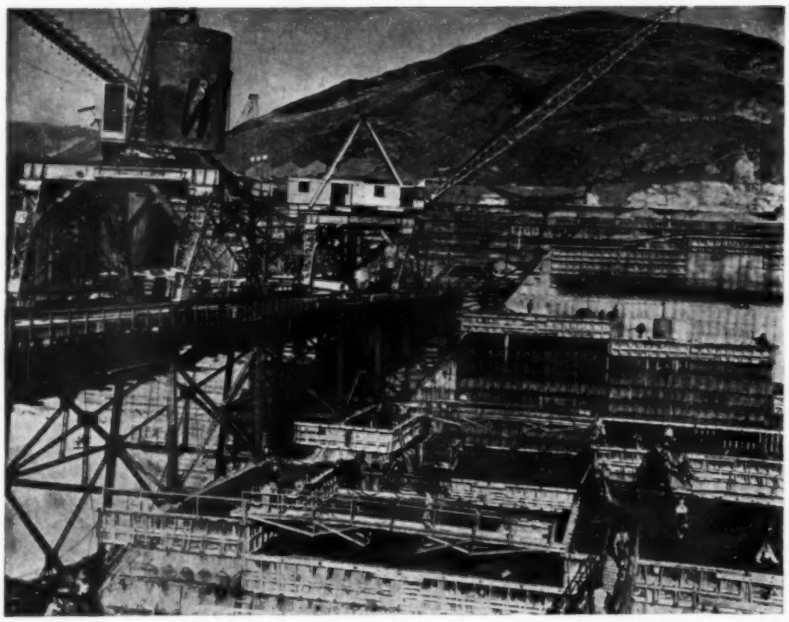
SINCLAIR TEN-OL, the new alloyed lubricant for "Caterpillar" Diesels, will mean a tremendous saving in your Diesel operation. In full power comparative laboratory tests, "Caterpillar" Diesel engines lubricated with Sinclair Ten-ol gave ten times as many service hours without shutdown as the finest straight mineral oils. In the average of all tests, consumption of Ten-ol was approximately one-half that of high grade straight mineral oils. In one of the tests a Diesel lubricated with Sinclair Ten-ol operated at extremely high overload with no damage to the engine and all lubricated surfaces kept in perfect condition.

Above are *unretouched* photos of pistons removed from "Caterpillar" Diesels after the tests. The piston to the left was lubricated by the finest grade of straight mineral oil. The piston on the right was lubricated by Sinclair Ten-ol in a test *ten times as long* as the one on the left. Look at the difference!

Order Sinclair Ten-ol, Sinclair Diesel fuel, and other Sinclair products from your local Sinclair office or write Sinclair Refining Company, 630 Fifth Avenue, New York, N. Y.

SINCLAIR
TEN-OL

(Recommended as a "New Outstanding Diesel Engine Lubricant" by Caterpillar Tractor Co.)



● *A close up of some of the concrete blocks over which the waters of the diverted Columbia will flow. At the extreme left can be seen a portion of bucket and toe of permanent dam.*

tunnel in the event of any interruption in service. "Empty" batteries are hoisted to a charging rack where an automatic switch cuts off current when the cells have been re-charged. These locomotives will operate an eight hour shift on one charging.

Two years ago the Metropolitan District took over this phase of the work from the original contractors and has been prosecuting the job on force account ever since. Mr. C. T. Thomas, Jr., is superintendent in charge. Thanks are extended to him and to Mr. Ed. M. Hannaman, in charge of structural steel work, for much of the information here given.

Grand Coulee 69% Complete

WITH only half the allotted time elapsed, construction of the first stage of Grand Coulee Dam is over 69% complete, Acting Reclamation Commissioner John C. Page reported to Secretary of the Interior Harold L. Ickes.

Favorable weather and a comparatively low flow in the Columbia River has permitted the work of unwatering the central section of the dam site to proceed at a rapid pace and this phase of the work now is almost a month ahead of schedule. Since the river was diverted last month efforts have been concentrated on completing the cross-river cofferdams to their full height and pumping the central section dry so that the final excavation may be undertaken.

Meantime a belt conveyor system for removing the earth which overlies the bedrock in the central section is being erected by the contractor. This material will be transported on 60-inch belts to a spoil bank on the east side of the river, more than half a mile distant, and in excess of 150 feet higher than the scene of work.

The excavated material from the east and west sections where this work has been completed, was transported by a similar system of belts a distance of about a mile to Rattlesnake Canyon on the west side of the river. The west side conveyor has been dismantled and the equipment is being used in assembly of the new conveyor.

A total of more than 15,000,000 cubic yards of excavation already has been done in exposing the bedrock in the east and west sections.

In addition, more than 1,860,000 cubic yards of concrete have been placed in the structure, mostly in the west section. Because of cold weather little concrete will be placed during the months of January and February.

Construction activity will not decrease during these months, however, but will be concentrated on unwatering the central section, excavating the earth which overlies the bedrock in that area, extension of the placing trestles leading from the west side concrete mixing plant so that they will serve the central section in preparation for a major program of concrete placing with the advent of warm weather in the spring.

About 5,500 men are now employed at the dam site, this being within a few hundred of the maximum number employed to date.

A. I. M. E. Meeting

THE American Institute of Mining and Metallurgical Engineers will hold their 147th general meeting in New York, February 15-18. Headquarters will be the Institute Building, 29 W. 39th St., and the Waldorf Astoria Hotel.

Interesting papers have been prepar-

BUCYRUS-ERIE

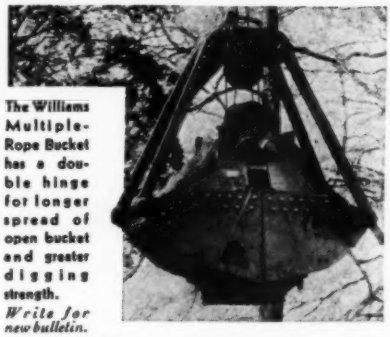
BIG pay loads

are assured with Bucyrus-Erie Bullgraders and Bulldozers. Fast blade travel with positive, hydraulic control increases work range, while balanced design makes full tractor power available to move big pay loads and cut dirt-moving costs. Write for bulletin.

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT . . SOUTH MILWAUKEE, WISCONSIN, U.S.A.

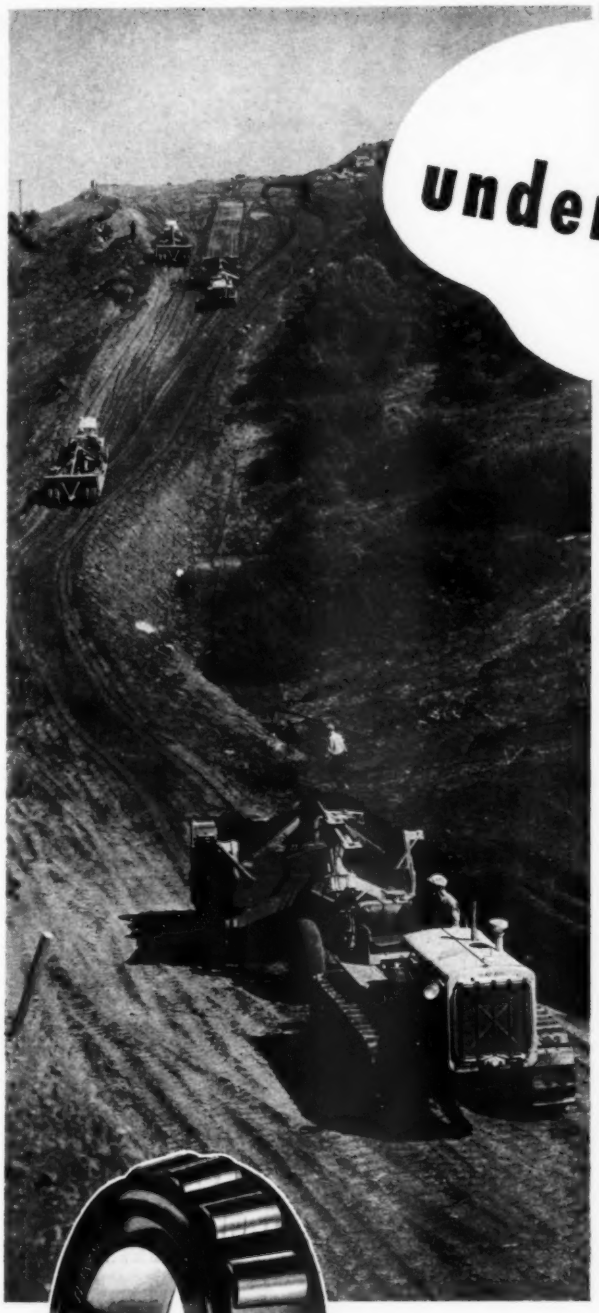
DIG faster with a WILLIAMS



The Williams Multiple-Rope Bucket has a double hinge for longer spread of open bucket and greater digging strength. *Write for new bulletin.*

The Wellman Engineering Co.
7002 CENTRAL AVE., CLEVELAND, OHIO

WILLIAMS
POWER-ARM, POWER-WHEEL, MULTIPLE-ROPE, DRAGLINE . . . . . buckets



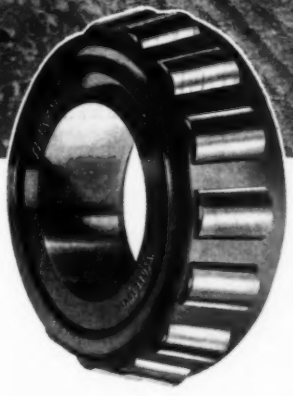
SAFE under the heaviest loads

The vital points of these LeTourneau 12 and 14-yard Carryall Scrapers — as well as the "Caterpillar" Tractors hauling them—are fully protected against radial, thrust and combined loads by TIMKEN Bearings.

Any kind of construction equipment is safe under the heaviest loads when TIMKEN Bearings carry them. Furthermore, moving parts are held in dead true alignment; power and lubricant demands are substantially reduced; machine life is extended; and maintenance costs are forced to rock bottom.

Throughout the construction industry—decisively licking its toughest jobs — you'll find TIMKEN Bearings in leading makes of power shovels, draglines, excavators, graders, concrete mixers, pavers, pumps, compressors and all other varieties of equipment.

"TIMKEN Bearing Equipped" is synonymous with satisfaction wherever it may be found. Look for it when buying.



Timken-equipped LeTourneau Carryall Scrapers hauled by Timken-equipped "Caterpillar" Tractors handling the bulk of the excavation on the North Approach to Golden Gate Bridge.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

TIMKEN TAPERED ROLLER BEARINGS

For your convenience in writing to The Timken Roller Bearing Company, you will find a card bound in this issue.

• Griffith Company uses two Caterpillar tractors equipped with bulldozers in backfilling a section of the Colorado River Aqueduct. Fill is being placed four feet thick above the top of the conduit. In left background the pipe enters the eight-mile Val Verde tunnel.

ed on the following subjects: Aviation; Mineral Economics; Mining Methods; Health and Safety in Mines; Eastern Magnetic Mining and Milling; Milling Methods; Non-Ferrous Metallurgy. In addition, the following Divisions of the Institute will hold special meetings: Mineral Education; Iron and Steel; Institue of Metals; Coal; Petroleum; Industrial Miners (non-metallics); Mining Geology. A special section will be devoted to Geophysical Methods of Prospecting.

A varied program of social entertainment has been arranged.

No Accidents Last Year on Lighted Tacoma Highway

THE Washington State Highway Department reports an enviable night-safety record during 1936 for the 2.9 mile stretch of Pacific Highway south of Tacoma, which it lighted with sodium safety lamps in December, 1935. Not one night accident has occurred on the stretch during the past year, L. V. Morrow, director of the department, reports to General Electric engineers who developed the lighting system.

"This record speaks particularly well for the efficiency of the lights when it is taken into consideration that 20 per cent of the installation is through a section which is built up immediately adjacent to the highway with fruit stands, produce markets, and small restaurants," Director Morrow declares. "At all hours of the day and a major portion of the night, but more particularly between the hours of 5 and 7 p.m., a large number of vehicles are leaving these places of business. The lights seem to have been particularly advantageous in bringing into view a vehicle entering upon the main traveled portion of the highway.

"The use of these lights has proved to be very effective during heavy fogs which are prevalent through this area, and also during other times when storms have been encountered.

"From the results obtained by this installation it is indicated that a much greater degree of safety is afforded the traveling public by such lighting."

Since the section of Pacific Highway

2 Good Reasons

POWER AND EFFICIENCY GO HAND IN HAND WHEN YOU ARE Gatke **equipped**

Gatke Moulded Asbestos Brake and Friction Blocks give more power to your steam shovels, draglines, dredges and hoists.

Smoother operation and accurate control assure longer life and more efficient all-around service.

We will cheerfully furnish complete information on Gatke Products upon request.

GATKE CORPORATION
228 N. La Salle St., Chicago

A TRAILER FOR Every Heavy Duty Requirement

- *Fully Reversible—Pulls from either end*
- *Brakes on all wheels controlled from either end*
- *Pneumatic Tires*
- *Meets all road width restrictions*

Trailers of all types and up to any capacity.

Write or Wire

C. R. Jahn Co., LaCrosse, Wis.

Here Is a Bargain
in used excavating equipment
(taken from page 129)

BUCYRUS-ERIE 10-B GASOLINE DRAGLINE. 28' Boom. Hercules 6 cylinder gasoline engine. ¾ yard drag bucket. Used approximately one year. Excellent condition. Located vicinity Chicago. Box 979-SD.

For other bargains in shovels, draglines, cranes, locomotives, trenchers, and miscellaneous contractors' equipment turn to pages 128 to 131.

The largest listing of Used Equipment offered by any Publication Serving the Excavating Industry.

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

BUCYRUS-MONIGHAN

works and moves on the unstable footing provided by loose sand and silt. Its double set of bearing areas (one set, the treads; the other, the large circular base) find ample bearing to support the machine. Its step-by-step operation does not cause the machine to dig itself in. Manufactured by Bucyrus-Monighan Company, Chicago, Illinois.

Illustrated is a Bucyrus-Monighan 5-W owned by Morrison-Knudsen Co., excavating on the New York Barge Canal.

BUCYRUS-MONIGHAN

Sold by BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WISCONSIN, U.S.A.

For your convenience in writing to Bucyrus-Erie, you will find a card bound in this issue.

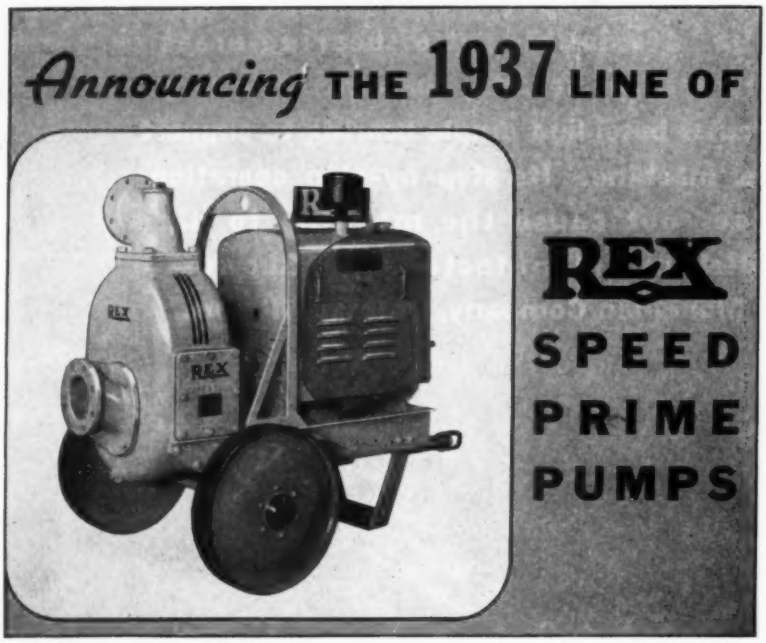
which is lighted was newly constructed at the time of the installation, and had not been used by motor vehicles previously, comparative figures on the number of accidents before and after lighting are not available.

Sardis Dam Plans

U. S. ENGINEERS at Vicksburg, Miss., have issued plans and specifications for the construction of the Sardis dam and abutment dikes on the Little Tallahatchie River, six and a half miles southeast of Sardis, Miss. Bids will be opened at 11 a.m. Tuesday, March 9, at Vicksburg.

This job is the start of a program to control floods in the Yazoo Basin. It involves the building of a dredge or dredges at the site of the work to construct the main dam and abutment dikes about 13,500 feet long with a maximum height of 95 feet above the valley floor and a top width of about 40 feet—within 1,200 calendar days. No work will be permitted on Sundays and holidays, but day and night operations are desired. Progress must be at the rate of 500,000 cubic yards per month, and if the contractor falls behind, his liquidated damages will run as high as $300 per day.

Only $515,000 is available for payment of contractor's estimates. The successful bidder will be required to take his chances on future appropriations by Congress for this authorized project. Estimated quantities are as follows: excavation, 2,364,000 cubic yards; rolled fill, 1,678,000 cubic yards; hydraulic fill, 12,545,000 cubic yards; gravel filter, 9,200 cubic yards; 12-inch corrugated metal pipe in place, 700 linear feet; 18-inch corrugated metal pipe in place, 8,630 linear feet; and 24-inch corrugated metal pipe in place, 3,360 linear feet.



They are new and modern, built on the Speed Prime Principle. Capacity to handle dirty water is increased. You can put them in the hole and forget them—Rex Speed Prime Pumps are fully automatic.

Complete Range of Sizes, Capacity, Mountings, Gasoline or Electric Motor Drive.

2″ to 8″ Models—7000 to 125,000 Gallons per hour.

See us or write for 1937 Catalog and Prices.

2″	Model	7M
2″	Model	10M
3″	Model	15M
3″	Model	20M
4″	Model	30M
4″	Model	40M
6″	Model	75M
6″	Model	90M
8″	Model	125M

CHAIN BELT COMPANY 1652 W. Bruce St., Milwaukee, Wis.

REX CHAIN BELT COMPANY of MILWAUKEE Speed Prime Pumps

Budget for 1937-1938

IN presenting to Congress his budget for the fiscal year 1937-1938, President Roosevelt increased the total expenditures for public works to $451,108,963. For the fiscal year ended on June 30, 1936, expenditures for general public works were $124,429,000; and for the present fiscal year, the total is estimated at $318,590,000.

Division of funds asked in the new budget is given in the following table:

Tennessee Valley Authority	$49,000,000
Veterans' Administration	10,000,000
Department of Agriculture	152,000,000
Department of Commerce	1,000,000
Department of the Interior	58,052,000
Department of Justice	600,000
Department of State	4,250,000
Treasury Department	45,306,963
War Department	130,000,000
Total	$451,108,963

New All-American Canal Bids

THE Bureau of Reclamation announces that sealed bids will be received until February 15, 1937, and then publicly opened for furnishing labor and materials and performing all work for the construction of drops and power plant structures at drops Nos. 2, 3, 4, and 5, All-American Canal system, Boulder Canyon project, Arizona-California-Nevada. Tho work is located between Yuma, Arizona, and Calexico, California.

These jobs involve 149,860 cubic yards of excavation, 90,660 cubic yards of backfill, 39,160 cubic yards of concrete, 4,060 square yards of dry rock paving, and 3,340 cubic yards of reverse filters. 4,462,000 pounds of reinforcement bars are to be placed, 1,596 linear feet of 8-inch and 15-inch sewer pipe are to be laid, 2,148,000 pounds of steel sheet piling, 114,000 linear feet of timber foundation piles must be driven, and 228,400 pounds of radial gates and hoists, 200,000 pounds of metalwork, and 3,800 feet of electrical metal conduit have to be installed.

The usual posting of bonds and guarantee are required, and all work is to be completed within six hundred and sixty (660) calendar days.

Liquidated damages for delay will be one hundred dollars ($100) per day for each uncompleted schedule or part.

Copies of the standard forms and specifications may be obtained from the Bureau of Reclamation at Yuma, Arizona; Denver, Colorado; and Washington, D. C.

Profits accrue from increased production plus low upkeep costs over a period of time. Realizing this and realizing also that rock drills are subjected to hard usage and rough treatment, Sullivan, in the development of the L-2, ran exacting tests over a long period. These tests were concluded only after the Sullivan engineers were convinced of the L-2's outstanding performance and OF ITS PROFIT-MAKING POSSIBILITIES FOR YOU. Put L-2s on your job and thereby discover the real value this machine has for you!

REAL PERFORMANCE!

SULLIVAN MACHINERY CO.

307 N. MICHIGAN AVE., CHICAGO, ILLINOIS

SULLIVAN makes Rock Drills & Accessories, Air Compressors, Detachable Bits, Coal Cutters, Hoists, Core Drills.

For your convenience in writing to Sullivan Machinery Co., you will find a card bound in this issue.

Not in the Contract

Our ear-to-the-ground department reports that an old maid created quite a stir in the local seed store the other day. She walked in and asked the clerk to give her instructions on how to sow wild oats.

He: "There's a certain reason why I love you."

She: "My goodness!"

He: "Don't be ridiculous."

"Hey, mister! Yer engine's smokin'."

"Well, it's old enough."

Landlady: I think you had better board elsewhere.

Boarder: Yes, often.

Landlady: Often what?

Boarder: Had better board elsewhere.

Old Lady: And what kind of dog is that you're leading, little man?

Boy: It's a police dog.

Old Lady (regarding scrawny mongrel pup): That doesn't look like a police dog.

Boy: I know it, he's in the secret service.

Oiler on Night Shift: I just read that a single Mormon used to have as many at ten wives:

Night Foreman: Is that so? And how many did the married ones have?

One day little Audrey locked the bathroom door and threw away the key and then laughed and laughed and laughed because she knew her father was going to have a beer party that night.

"I'm going to cross on one of those new stabilized steamships."

"Say, they're expensive."

"Yes, but expenses aren't what I worry about keeping down on my ocean trips."

In commenting on the recent death of the 106-year-old man who attributed his long life to the use of whiskey, Nellie Teetotal said: "It always gets 'em in the end."

We know a shovel runner who married a girl who had a twin sister. When we asked how he told them apart, he said:

"Hell, I don't bother; the other one has to look out for herself."

"Hello, State Bridge Department?"

"Yes."

"Well how many points for a vulnerable little slam?"

Before marriage a man yearns for a woman. After marriage the "y" is silent.

The boss was complaining to his stenographer about the fine dust on his desk. He asked her what she did with the underwear she wore out. She replied that she generally wore it back if she could find it.

Wife: John, give me that letter! The handwriting is a woman's, and you turned pale when you read it. I'm suspicious.

John (handing over letter): Very well, my dear, it's from your dress shop.

The first examination question was: "Give the number of tons of coal exported from the U. S. in any given year."

Tommy scratched his head, then wrote: "1492—none."

He: How many drinks does it take to make you dizzy?

She: Two, and don't call me Dizzy.

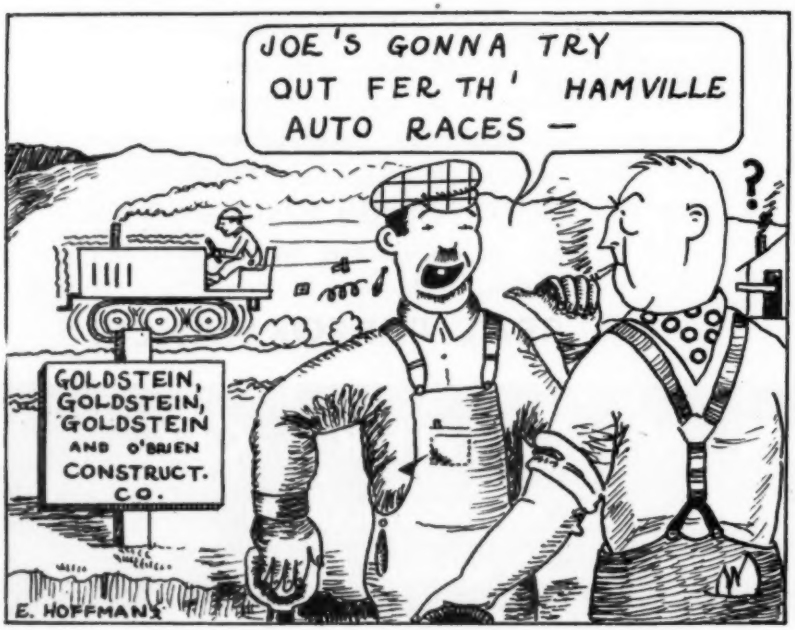
"Are you sure you can cut your meat?" the hostess asked her very young guest.

"Oh, yes," the boy replied, "we often have it as tough as this at home."

A contractor attending a recent banquet was seated next to a large lady with a flowing tongue. He had long since ceased listening, when he suddenly realized she had asked him a direct question.

"After all," she said, "breeding isn't everything, is it?"

Still slightly dazed, he answered: "Well, maybe not, but it's a lot of fun."



Any Width to 14 Ft.--
Laid Smooth as Velvet--
Faster than Your Plant Can Mix

With its 18 ft. straight-edge runners to equalize the surface, its semi-crawler traction all on hard subgrade, its pug-mill spreader, its ability to blend smooth joints and adjustability up to 14 ft. widths—the Jaeger Paver lays precision smooth pavements, faster and at lowest known cost. Send for Catalog and Prices.

THE JAEGER MACHINE CO. 553 Dublin Avenue Columbus, Ohio
World's Largest Builder of Spreading and Finishing Machines

JAEGER *Bituminous* **PAVER**

HAYWARD BUCKETS

PLAY SAFE . . .
CHOOSE HAYWARDS

Hayward Buckets won't fall down on the job, cause time out, or require costly repairs.

THE HAYWARD COMPANY
52-54 Church Street
New York, N. Y.

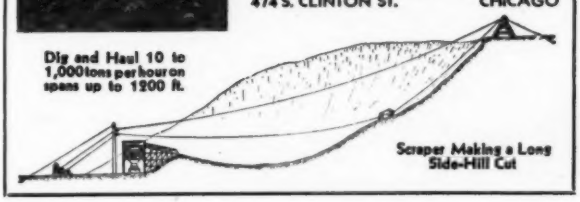
SAUERMAN SCRAPERS

Low cost machines for:

Pit and Bank Excavation, Strip Mining, Stockpiling and Reclaiming Coal, Ore, Stone, etc., Making Long Cuts and Fills, Cleaning Reservoirs.

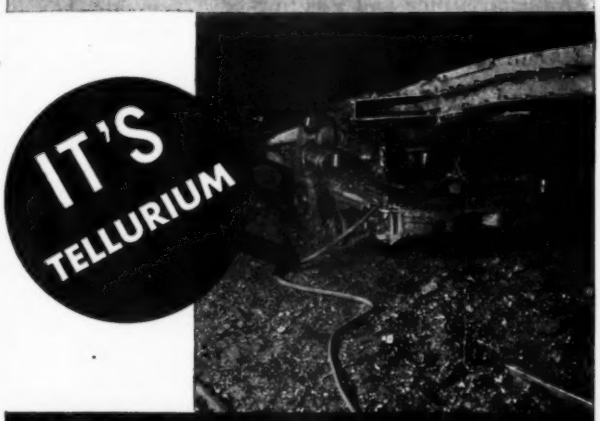
SAUERMAN BROS.
474 S. CLINTON ST. CHICAGO

Dig and Haul 10 to 1,000 tons per hour on spans up to 1200 ft.



Scraper Making a Long Side-Hill Cut

FOR THIS SERVICE CABLE MUST BE TOUGH



TRY IT ON YOUR ELECTRIC SHOVELS

THIS is the story of a visit to a large West Virginia coal mine in search of information on G-E tellurium-rubber cable.

Our party, accompanied by the superintendent, rode the cars three miles to the face, where we found this loading machine going full blast.

Through the din and dust, we viewed the action. As the cars banged in and out, we tried to watch the cable. Sometimes it was buried in the ever-moving coal; once it was under the tractor tread of the loader. Then it was on top of a car; next time, under the wheels of a car. These things happened despite the helper's efforts to take care of the cable.

Cable Was in Good Shape

The photograph, unretouched, shows the cable rather clearly. Those several tapings covered bruises, the operator said, where the cable was jammed by a "motor" up against the solid block of the loader. Aside from these, however, the cable was in good shape, with few nicks and no signs of wear.

The operator swore that the cable was *great*. The superintendent concurred—said that it was giving excellent service. The same opinion was expressed by other mining men to whom we talked.

Try Out Tellurium Cable

When next you need cable for replacement on any of your cutters, loaders, reel locomotives, electric shovels, or other portable equipment, give G-E tellurium-rubber cable a trial. It is really tough stuff and will give the best of service. Your G-E jobber can supply all types and sizes promptly. For prices and specifications, see Bulletins GEA-1728 and GEA-1918. Address nearest G-E jobber, G-E sales office, or General Electric, Dept. 6B-201, Schenectady, N. Y.

This ad is one of a series written after visits to coal mines in Pennsylvania, West Virginia, and Ohio. Names of the mines and of the men interviewed will be furnished upon request.

520-98

GENERAL ELECTRIC

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

Spillway at Fort Peck

(*Continued from page 95*)

Daley is general superintendent, and C. L. Beach master mechanic.

Addison Miller and Fielding & Shepley

The combined firms having the contract for building the gate structure, hanging the gates and counterweights, and also placing the cut-off wall at the lower end of the lined channel, received notice to proceed late in May, 1935. General design of these structures has been described earlier in this article.

About 516,000 yards of excavation was handled in connection with this contract. The first work was stripping off the 4-foot protective layer left on the final grade by Spillway Builders. Cuts to line and grade were made with ingenious electric shale saws. Vertical cuts were made for trenches and drag shovels removed loose blocks of shale ahead of a horizontal saw which trimmed to final grade for slab foundations. For 220 feet up-stream from the gates, the 820-foot wide approach channel was lined with a minimum three-foot reinforced concrete slab with shear keys under all cold joints.

In addition to the previously mentioned cut-off wall, sunk a maximum of 130 feet into the shale at the end of the lined section, Addison Miller and Fielding & Shepley constructed a 30-foot cut-off wall, 10 feet wide, immediately upstream from the gate structures. The purpose of this is to protect the gates from undermining. Vertical shale saws cut the sidewalls for this trench, the material was shot slightly and removed by clamshell buckets. The work was handled in sections, which were braced and filled with reinforced concrete as soon as completed. Structural steel was used for bracing deep trenches.

The five-foot diameter pile holes, 30 to 43 feet deep, which support the heavy concrete slab on which the gate structure rests, were put down with an electric auger operating from a high-boom crawler crane. Immediately upon completion, each hole was sprayed with bituminous sealing solution. When a group had been so finished, reinforcing steel was set in the form of a pre-fabricated cage with bars spot-welded, and the concrete cylinders were poured.

Main blocks resting on these cylinders were poured in 52- by 75-foot sections 12 feet thick, and heavily reinforced with steel. A nest of hoppers with sectional spouts enabled the 16-hour pours to be handled without coating the upper steel with cement spatters before the concrete mass reached that level.

In cold weather, concrete pouring was more difficult. Live steam was used to keep the concrete from freezing during pours. Extreme hot weather conditions also made the precise placing of structural steel and machined guides for the gates a difficult job.

In addition to shovels, cranes and draglines, the principal erection tool used on this contract was a steam-operated, 120-foot boom, traveling derrick, running on wide-gage tracks and covering the entire curved section of the gates. Concrete buckets and sections of forms were handled by this derrick. Blaw-Knox steel forms were used in constructing the streamlined, heavily-reinforced concrete piers and training walls.

Despite the unusual size of the job, and difficulties of climate and shale, these contractors have done well with the concrete work. At present, paving the approach section and the 30-foot cut-off wall have been completed. Concrete has been poured for all piers and training walls. A good start has been made with excavation for the cut-off wall. The difficult problems of bracing such deep trenches in the shale has been solved.

H. C. James is superintendent for the combined firms of Addison Miller and Fielding & Shepley.

All spillway work is under the supervision of the Army Engineers; Lt. Col. Thomas B. Larkin, District Engineer in Charge; Major Clark Kittrell, C. of E., Chief of Operations. Captain John R. Hardin, C. of E., is in direct charge of spillway work.

● *Garage and repair shop, and part of Spillway Builders' big truck fleet are shown in this early photo. Efficient hauling of trucks was a feature of this contract.*

FOR SUBMARINE EXCAVATION

YOU CAN COUNT on dredge parts ordered from Bucyrus-Erie for dependable performance. Regardless of the make of your present machines, investigate Bucyrus-Erie quality, service and price whenever you need dippers, winches, pumps, booms, sticks, spuds, or other units for dipper, hydraulic, ladder or alluvial mining dredges.

Bucyrus-Erie Company
South Milwaukee, Wis., U. S. A.

BUCYRUS ERIE

BUCYRUS-ERIE DREDGES

For your convenience in writing to Bucyrus-Erie, you will find a card bound in this issue.

Trade Notes

Mr. H. C. Emery has left the St. Louis territory of the **Bucyrus-Erie Company** to work under Mr. H. A. Titus out of the Kansas City office. His place has been taken by Mr. E. W. Shuck, formerly of the **Victor L. Phillips Company**, Bucyrus-Erie agents in the Wichita, Kansas District.

Mr. Shuck has spent considerable time in the Bucyrus-Erie Company's plants at Erie and at South Milwaukee, familiarizing himself with their products, and has been in St. Louis since late October getting acquainted with the surrounding territory.

The Lincoln Electric Co., Cleveland, Ohio, has appointed Wm. F. Fischer to the sales staff of its San Francisco office, 866 Folsom Street.

Erby-Camlin Co., Inc., of Chicago and Rockford, Illinois, announce the affiliation to their organization of John A. Wisner as Sales Engineer.

Mr. Wisner has been connected with the Chain Belt Company of Milwaukee for the past several years. He has also been connected with the **Bucyrus-Erie Company** of South Milwaukee.

C. E. Patterson formerly Vice President in charge of Engineering Manufacture and Sales of the **Athey Truss Wheel Co.** announces the opening of engineering and sales offices for crawler wheel equipment in the LaSalle-Wacker Bldg., 221 N. LaSalle St., Chicago, Illinois.

Caterpillar Tractor Company announces the selection of Louis B. Neumiller as sales manager of its Central Sales Division, an area created by dividing the United States into three sales areas instead of the former two. It includes roughly the territory lying between the Rocky Mountains and the Mississippi River.

Dedicated to the encouragement of study and research for the benefit of the arc welding industry, a new foundation has been established by the **Lincoln Electric Co.** directors. It will be under the principal direction of Dr. E. E. Dreese, head of the Department of Electrical Engineering at Ohio State University, W. B. Stewart of the Cleveland Bar, and H. R. Harris, vice president of the Central National Bank of Cleveland.

C. A. **Barabe** of Rockford, Ill., formerly with the J. D. Adams Co. as Northern Illinois representative, has been appointed Sales Manager of the Road Machinery Dept. for the Tractor and Equipment Company.

According to an announcement by E. P. Teel, Vice-President and General Manager of the **Novo Engine Company**, Lansing, Michigan, R. B. Harvey has been appointed General Sales Manager of that company. Mr. Harvey has been with the Novo Company for nine years and has had much experience and many contacts in the engineering and industrial fields.

Mr. Walter H. (Wally) Wassman, for 12 years connected with the firm of Kendall & Cole, automotive machinists, Melrose Park, Ill., has been appointed Service Manager of the **Tractor and Equipment Co.**, 433 S. Jefferson St., Chicago, Ill., and replaces Mr. P. H. (Jim) Lash, who held the position from 1930-1936.

Book Reviews

A new practical, illustrated text on high speed Diesels has recently been published by the **American Technical Society**, Chicago, Illinois. Written by L. H. Morrison, **"High Speed Diesel Engines"** includes instructions on fuel injection and combustion systems, frames and cylinders, running gear, and construction details. All the different engines prominent in the field are well discussed; points being illustrated with photographs, drawings and cross section diagrams.

Written clearly and concisely, this text gives an excellent idea of modern Diesel engines, their applications, and things to know about their maintenance. Copies may be obtained from the **American Technical Society** for $2.50.

"Speed Patrols" are illustrated and described in a new Catalog issued by the **Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis.**

Action pictures show the machines working under many different operating conditions. Several pages are devoted to the tandem drive models brought out in 1936. Details of the controlled engine are fully explained and illustrated. Uses of the machine for ditching, finishing, snow removal, grading, scarifying, etc., are pictured as well as described. A copy of the Speed Patrol Catalog is available upon request.

Announcement has just been made by the **Extension Division of the University of California, Berkeley, California**, that their course in Diesel Engineering is now open for those who wish to enroll. The course presents a general discussion of the elements of the Diesel Engine so as to furnish the practical man with fundamental principles to assist him in the operation and maintenance of the engine.

The revised course has been laid out to cover numerous recent subjects. A few of the important points covered are: principles and theory of the Diesel engine, types, two and four stroke cycle engines, supercharging, precombustion and auxiliary air chamber engines, turbulence, Hesselman engines, fuels, and various principles involved in fuel pumps and fuel injectors, etc.

A person who enrolls in the course must have some knowledge of physics and mathematics, be able to substitute numbers in simple formulas, and perform the rudiments of mensuration in several of the problems given in the assignments. All of the fifteen assignments are fully illustrated by diagrams and blue-prints.

POSITIONS WANTED

Positions wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00. Advertisements for help wanted free of charge.

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

EXPERIENCED OPERATOR

Operator with 13 years' experience on shovels, 3 on clamshells, and 2 on cranes desires position in South. Has operated steam and gas rigs in road construction, bridge work and basement excavation. Prefers work on Bucyrus-Erie or Lorain gas machine. Single, 31 years old. Can furnish very best references. Located Massachusetts. Box 8501.

DRAGLINE OPERATOR

Operator having 10 years' experience on Diesel dragline, on levee and canal construction desires position on Diesel machine of 3 to 8-yard capacity, preferably Bucyrus-Monighan dragline. Willing to go anywhere. Can do own repair work. A-1 references. Age 30; married. At present located in Nebraska. Box 8301.

OPERATOR

15 years dragline experience — 5 years on steam, 8 years on electric and 5 years on Diesel machines. Can do own repair work, prefer steam or electric Bucyrus machine, large or small. 51 years old, married. Can furnish excellent references. Now located Tennessee. Box 8402

EXPERIENCED OPERATOR

Operator having 17 years' experience on all types of excavating machines desires position on drag shovel, dragline, Bucyrus-Erie or Northwest, gas or Diesel. Can handle any machine from one to 8 yards. Experience includes four years on steam machines, two years on electric, 8 years on gasoline, one year on Diesel and two years on Gas plus Air. Have two years experience on drag shovel on pipe line work. Willing to go anywhere in the U. S. A. Age 36; married. Can do own repair work and have best of references. Present location, Florida. Box 8401.

OPERATOR

Experienced operator desires position; will take work anywhere. Has 17 years experience; two on shovel work, nine on draglines, two on clamshells, four on cranes. Has operated steam rigs five years, electric two years, gasoline five years, Diesel five years. Prefers work on Bucyrus-Monighan or 41-B, steam or Diesel rig, one to six-yard size. Can do own repair work; 34 years old, married, can furnish good references. Now located in Ohio. Box 8601.

SHOVEL-DRAGLINE OPERATOR

8 years' experience on shovel work, 2 years' on steam dragline, all in quarry excavators. Willing to go anywhere. Prefer working on standard Marion or Bucyrus-Erie machines. 35 years old, married. Can do own repairs. Special references. Now located southern Indiana. Box 8502.

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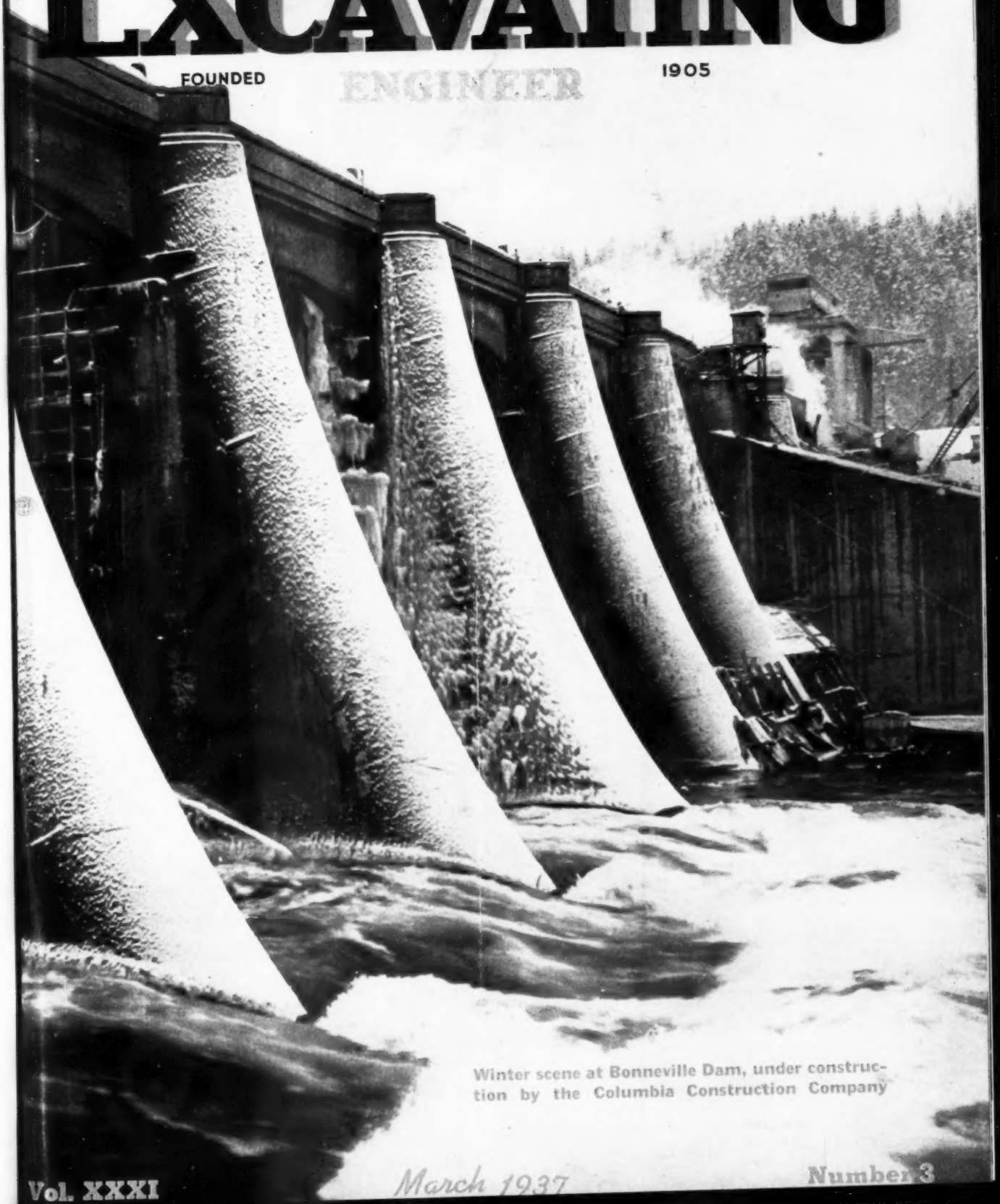

Winter scene at Bonneville Dam, under construction by the Columbia Construction Company

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